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SECRETARY LONG'S ANNUAL REPORT.

Following are some of the salient and essential paragraphs in the annual report of Secretary John D. Long of the navy department, which has just been transmitted to the president:

"The need of line officers for sea duty becomes steadily more pressing, and in case it should become necessary to man all vessels of our present fleet the required number is not available, and I recommend that the number of lieutenants be increased from 300 to 350 and that the limit of the number of junior lieutenants and ensigns be made 600."

"I concur with the chief naval constructor that there should be an increase in his corps. With more ships to build there must be more constructors."

"Enlisted personnel.—I cannot too earnestly call attention to the necessity for an increase of this most important branch of the navy. As with the officers so with the enlisted men. The ships of the navy have been greatly increased in number but commensurate steps have not been taken to provide the necessary crews for them. I recommend that the present enlisted force be increased by 3,000 men."

In the following tables the secretary compares our own personnel with that of the other principal naval powers:

NUMBER OF COMMISSIONED OFFICERS OF THE EXECUTIVE BRANCH.

Nation.	1896.	1897.	1898.	1899.	1900.	1901.
England	1,728	1,768	1,804	1,897	1,970	2,085
France	1,612	1,707	1,695	1,662	1,663	1,663
Germany	723	749	785	826	905	974
Russia	859	1,089	1,002	1,023	1,096	1,096
Japan	.....	.....	619	700	724	.....
Italy	586	586	720	748	768	.....

NUMBERS ON THE UNITED STATES NAVY LISTS, INCLUDING THE FORMER ENGINEER OFFICERS (165 IN 1900 AND 155 IN 1901).

1896	715	1899	704
1897	712	1900	717
1898	712	1901	728

TOTAL STRENGTH OF ALL RANKS AND RATINGS.

Nation.	1896.	1897.	1898.	1899.	1900.	1901.
England	93,750	100,050	106,390	110,640	114,880	118,625
France	45,113	45,461	48,783	44,620	49,775	.....
Germany	21,485	23,302	24,906	26,651	30,386	.....
Russia	40,500	40,184	42,500	39,546	39,546	.....
Japan	23,000	23,000	23,000	23,000	26,108	.....
Italy	24,200	24,200	25,669	24,560	25,804	.....
United States	13,460	13,218	12,218	20,275	23,453	.....

The English figures in the above table include the royal marines. The French marine infantry is not included. The United States figures do not include marines. The Russian naval estimates for 1899 proposed increasing the total force to 52,250 in 1900, and to 57,500 in 1901. England increases her naval personnel by making provision in the estimates of each year for a sufficient future increase in officers and men to man the new ships. France has proposed this year to add to her personnel 150 lieutenant-commanders, 116 lieutenants, 101 ensigns and cadets, and 170 engineers. This increase is to be made at the rate of sixty-three line officers and twenty-eight engineers per year. France also proposes to increase her enlisted force at the rate of 2,320 men yearly. Germany provides for the future increase of the naval personnel in systematic manner under the law governing her ship building policy. This increase is fixed by law, as follows:

Year.	Line officers.	Other personnel.	Total.
1900	876	22,476	23,352
1905	1,179	31,187	32,366
1910	1,482	39,898	41,380
1915	1,785	48,609	50,394
1920	2,088	57,320	59,408
Total increase, 1900 to 1920	1,212	34,844	36,056
Average annual increase	60.6	1,742.2	1,802.8
Average increase in five years	303	8,742.2	9,014

The secretary recommends that the title "midshipman," which is full of historic associations, be restored and substituted for "naval cadet;" that an engineering experimental laboratory be established at the naval academy for the use of the cadets in their studies; that the number of cadets at the naval academy be increased 50 per cent., as recommended by the general board, and that there be appointed annually by the president ten at large.

Upon the subjects of smokeless powder and armor the secretary says: "The manufacture of smokeless powder has progressed satisfactorily, both at the government works and at those of private manufacturers. The department in June last ordered a board of naval officers and chemists to revise the specifications for the manufacture of smokeless powder, and to draw up rules for its test, examination and storage both in magazines on shore and on shipboard, and specific instructions on these points have been issued throughout the service. In addition a general examination and chemical test were made of all smokeless powder in the naval service, and the results are satisfactory. The capacity of the armor plants is now about 7,500 tons a year of armor of the best quality; and at the instance of the department the manufacturers are making preparations to increase their output to 10,000 or 12,000 tons a year in order to complete deliveries in accordance with present contracts and also in order to be ready to provide armor for additional vessels should they be authorized by congress. They have already turned out more armor than was anticipated. Under authority vested in the department by congress contracts were signed November 28, 1900, for over 37,000 tons of armor required for vessels authorized and building. Comparing tests made in this country with reports of those made abroad, our armor seems to be the best that can at present be produced, and the price at which it is obtained is lower than that paid abroad. Deliveries amounting to nearly 2,000 tons have already been made under these contracts."

The concluding part of the secretary's report is the most important, recommending the following naval program:

Three first-class battleships.
Two first-class armored cruisers.
Three gunboats, each of about 1,000 tons trial displacement.
Three gunboats, each of about 200 tons trial displacement, for insular service.
Three picket boats, each of about 650 tons trial displacement.
Three steel sailing training ships, each of about 2,000 tons trial displacement.
One collier of about 15,000 tons trial displacement.
Four tug boats.

SENATOR FRYE ON OUR MERCHANT MARINE.

Senator William P. Frye of Maine was the guest of honor of the Commercial Club of Boston last Saturday evening. He said in part:

"With an almost limitless seacoast, capacious harbors, boundless forests, iron and coal in rich abundance, skilled laborers, sagacious and bold business men, large capital, an ever-increasing foreign commerce, we have permitted the other maritime nations, our inferiors in most of these regards, to seize upon the pathways of the oceans of the world and hold them to our exclusion. Last year the climax of decadence seems to have been reached, the worst year in our history. In the trade between the United States and Europe not one American vessel came from or went to Germany, Russia, Sweden, Norway, Denmark, the Netherlands, Italy, Austria-Hungary, Greece or Turkey. Two small vessels came from France, one of these in ballast; one from Belgium, in ballast, and one cleared from Spain. There entered or cleared from ports of the United Kingdom eleven sail vessels, two small steamships, both in ballast. This does not include the four ships of the American line. The North German Lloyd line carried last year more cargo than all of our ships together engaged in the foreign trade. It is not only humiliating, but may be exceedingly dangerous to our prosperity. Suppose Europe should be embroiled in war; that England and Germany, our carriers, should enter upon a conflict of arms; who would carry our exports of farm, factory and mine products? If carried, who would pay the enormous war premiums? If exportations were seriously crippled, what would become of our home industries and the workingmen who conduct them?

"Discussion of the causes leading to this lamentable result is necessary only so far as it may be suggestive of remedies. The theoretical free trader ascribes it to our policy of protection. The fact is, when we protected we carried 90 per cent. of our exports and imports; without protection, a trifle over 8 per cent. Our coastwise fleet has been protected for a century by a Chinese wall; no foreign nation being permitted to engage in it. What is the result? The most magnificent fleet in the world, with a tonnage exceeding that of any other country, probably twice that of any other, with freights lower than elsewhere. Our lake, river and coast vessels carried two years ago 180,000,000 tons of freight and 200,000,000 passengers.

"It is not protection which has harmed us, but the entire lack of it, the compelling of our ships to compete with those of other maritime nations protected by subsidies, by much lower wages in ship yards and on ships, and by a less expensive manner of living. Our ships cost from 15 to 20 per cent. more than those of our competitors. We pay our officers and sailors on American ships near twice more than they are paid on the ships of our competitors. Eighty per cent. of all steamships fourteen knots and upward receive subsidies. Foreign nations, to encourage their merchant navies, pay annually $25,000,000, $20,000,000 to the faster steamships. We paid last year $17,000 for carrying our mails to Brazil, Argentina, Uruguay and Paraguay—less than we pay for one large gun—while England paid $195,000 for her mails to the little island of Jamaica

"Are we, rich and prosperous, to submit to such humiliating and dangerous conditions? What would you think of the merchant who employed the commercial traveler of his rival house to sell his goods? All other nations recognize as a fact that carriers of their own are a necessity to the prosperity of their commerce, and expend generously of their money to this end, and not one of them depends so largely for prosperity upon the extension of its markets as we do.

"What benefit could we hope to realize from discriminating duties? Of course, no duty can be laid on exports and we must deal with imports alone. Again, retaliation would be certain to follow. The abrupt termination of all of the commercial treaties would arouse a very hostile spirit the world around.

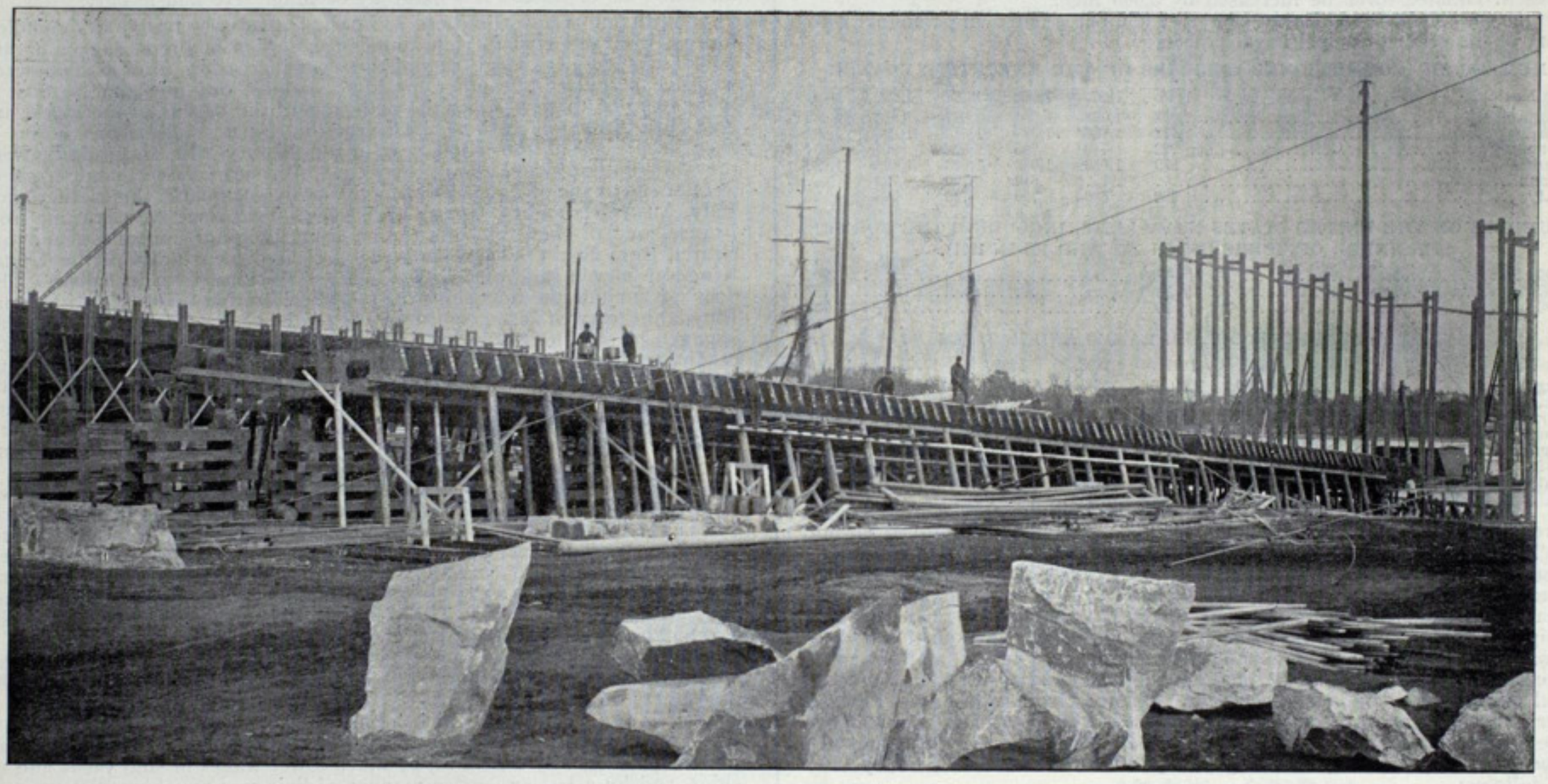
"There must be a remedy for this mortifying and dangerous condition, and it is the duty of congress to find it at the earliest day possible in the interest of our people. The first and imperious necessity is the establishment of regular lines of reasonably fast steamships from our commercial points to those of foreign countries, especially from the Pacific coast east and from the Atlantic to South America, for here is the promise of our greatest commercial expansion. Such lines build up a trade, carry mails, establish the necessary facilities abroad, carry as freight our farm products of all kinds, our fruits, our perishable products, and their ships serve as auxiliaries to the navy in time of war. In my opinion, the result of long-continued and careful consideration, certainly inspired by no selfish purpose, never having a dollar interest in ships—possibly by my Americanism somewhat intense—the only way to restore us to our legitimate position on the sea is to pay, directly from the treasury, annually, so much money as shall equalize the conditions between our ships and those of our competitors, whether they be slow or fast, regular or irregular, sail or steam. During the congress about to meet I shall persist in my efforts to secure favorable legislation for our merchant navy, and I bespeak for such attempt the sympathy of the business men of Boston."

SEVEN-MASTED STEEL SCHOONER.

Modern ship building demands quick work which shall be at the same time economical and careful, and such work can only be done when the equipment of the ship yard includes all the latest improvements of machinery and method that marine engineering has made available. An illustration of this point is to be found in the seven-masted steel schooner now being built by the Fore River Ship & Engine Co. at Quincy, Mass., the keel of which was laid on Nov. 1. The principal dimensions of this first seven-master, which will be the largest sailing vessel ever built, are as follows: Length over all, 403 ft.; length on water line, 368 ft.; molded beam, 50 ft.; molded depth, 34 ft. 5 in.; load draught, 26 ft. 6 in.; gross tonnage, about 6,000 tons; displacement at load draught about 10,000 tons. This schooner is being built for a syndicate headed by Capt. J. G. Crowley, a veteran schooner manager.

She is the first schooner to be built at the Fore River yard, which has also under way two of the new battleships, the New Jersey and Rhode Island, the cruiser Des Moines, and the torpedo boat destroyers Lawrence and Macdonough. The Fore River yard is the newest ship yard in the country and its equipment is consequently of the latest design. The vessel will be built on a foundation of Quincy granite obtained from the neighborhood and laid on a beach of hard gravel. The keel blocks were landed from a schooner, and put in place in two days. Within a week the keel was laid, having been drilled by gangs of six drills working simultaneously, and in two weeks the framing for the inner bottom was in place. There will be a space 4 ft. between the inner and outer skin and about 1,200 tons of water ballast can be carried. The double bottom is of cellular construction, the floor plates being perforated by means of a man hole punch which is probably the largest now in use. The steel ship building structure under which the schooner, as well as the two battleships will be built, will support eight traveling electric cranes, each of 5 tons capacity. The plating will be on the "joggle" system, a joggling machine makes the use of liners unnecessary, and having a capacity for working a ¾-in. plate.

This schooner will have steel lower masts 135 ft. from step to cap with 60-ft. pine topmasts. These masts will be stepped by means of a 75-ton folding gantry crane, which travels along a 900-ft. outfitting dock and takes the place of shears. The vessel will be equipped with steam steering gear and modern steam hoisting engines, winches, capstans and pumps. It is expected that the new schooner will be ready for launching within 4 months and that she will be used in competition with steamers in the foreign carrying trade. Her first cost is about $250,000, and she will be extremely economical in operation, requiring a crew of only sixteen men, although carrying a cargo of about 8,000 tons.



SEVEN-MASTED STEEL SCHOONER TWO WEEKS AFTER THE KEEL WAS LAID.
Building at the yards of the Fore River Ship & Engine Co., Quincy, Mass.

Mr. Carnegie has said that the iron industry is either a prince or a beggar. It either makes money fast or loses it fast. This tendency of the iron trade is well illustrated by the following history of Jefferson Furnace, in Jackson county, O., which was built in 1854 and is again in the active list. The furnace was started in 1854 and paid no dividends for the first seven years of its existence. Then the following payments were made: 1861, 10 per cent.; 1862, 20 per cent.; 1863, 30 per cent.; 1864, 100 per cent.; 1865, 150 per cent.; 1866, 200 per cent.; 1867, 100 per cent.; 1868, 100 per cent.; 1869, 100 per cent.; 1870, 100 per cent.; 1871, 100 per cent.; 1872, 100 per cent.; 1873, 100 per cent.; 1874, no dividend; 1875, no dividend; 1876, no dividend; 1877, no dividend; 1878, no dividend; 1879, 30 per cent.; 1880, 200 per cent.; 1881, 100 per cent.; 1882, 100 per cent.; 1883, 70 per cent.; 1884, 60 per cent.; 1885, 50 per cent.; 1886, 30 per cent.; 1887, 20 per cent.; 1888, 20 per cent.; 1889, 25 per cent.; 1890-91-92-93-94-95-96 and 1897 no dividends; 1898-99, not operated; 1900, no dividend. In the forty-four years the furnace was operated it paid in dividends $957,500, an annual average of slightly over 43½ per cent.—Bulletin of American Iron and Steel Association.

NAVAL ARCHITECTS AND MARINE ENGINEERS.

The banquet of the Society of Naval Architects and Marine Engineers at Delmonico's, New York, as the concluding feature of their annual meeting was, as usual, a brilliant affair. Mr. Lewis Nixon presided. The principal address of the evening, an impromptu affair, was made by Mr. Charles M. Schwab, president of the United States Steel Corporation. Mr. Schwab said that if he could have told his hosts fifteen years ago, when the making of plates for warships had just begun in the United States, what he thought of some of the specifications they had sent to Pittsburg, he probably wouldn't have been invited to the banquet. "But the high standard the credit of American steel has reached," he said, "is due to the rigid specifications of the naval architects of that time." Mr. Schwab said that something like 1,200 plates were made for the Vesuvius before enough of the right kind were produced. Referring to the Steel Corporation, he said: "I want to tell you this, that when it comes to building ships the United States Steel Corporation will make the prices to you as low as it is necessary to get the business." He predicted that ships would be built to carry across the ocean at half the cost of the present day, at a profit to the ship owner.

"America," said Mr. Schwab, "will monopolize the commercial trade of the world. It costs more now to carry a ton of steel across the ocean than it does to make that ton out of pig iron. Why shouldn't we be interested in the manufacture of ships? We want you to use as much steel as you can in making them and to pay as much for it as you can afford."

Following is the list of guests at the banquet: Hon. C. M. Fowler, M. C., Hon. H. M. Goldfogle, M. C., Hon. Frederick Storm, M. C., Hon. Job E. Hedges, Rear Admiral P. C. Asserson, U. S. N., Rear Admiral F. T. Bowles, U. S. N., Lewis Nixon, Capt. J. W. Miller, Harvey D. Goulder, Oberlin Smith, W. M. McFarland, W. W. Ackerman and party of thirteen, John Fritz, John S. Hyde, F. J. Sprague, A. G. Smith and guest, R. C. Veit and guests, V. S. Cottman, Philip Ruprecht, J. W. O'Bannon, W. P. Howe, W. G. LeBoutillier, Macomb G. Foster, Percy A. Rockefeller, Naval Constructor John F. Hanscom, Naval Constructor W. L. Capps, Naval Constructor Lloyd Bankson, Naval Constructor D. W. Taylor, John F. Meigs, Carroll S. Smith and guests, Charles H. Cramp, Edwin S. Cramp, Colonel Tchernigosky, Chief Engineer Franzkevitch, Colonel Petroff, Lieut. Makedonsky, Wm. A. Dobson, Horace See, J. W. Shackford, Leopold Katzenstein, J. Katzenstein, Cr. Klack, A. R. Smith, S. N. Robinson, E. Platt Stratton, F. Marion Wheeler, Capt. Wright, Miers Coryell, Prof. C. H. Peabody, Darwin Almy, George H. Barrus, J. W. Kellogg, B. F. O'Connor, Julius Jonson, W. Irving Babcock, H. E. Grieshaber, Louis Eckert, E. B. Schoek, Wm. H. Deming, Charles B. Rowland, Stevenson Taylor and party of nine, Thomas F. Rowland, Sr., and guest, Thomas F. Rowland, Jr., and guest, F. P. Palen, George N. Gardner, Sr., George N. Gardner, Jr., Samuel L. Moore, Mason H. Chase, D. G. Moore, Lieut. A. P. Niblack, Howard Higgins, Mr. Hague, John Lloyd, Wm. Gordon, Mr. Lindsay, Joseph Barre, Wm. H. Bailey, Wm. Rowland, H. A. Magoun, W. D. Forbes, Mr. Sutliff, Assistant Naval Constructor J. W. Powell, Assistant Naval Constructor D. C. Nutting, Assistant Naval Constructor Henry Williams, Mr. Pelve, C. J. Wentz, J. E. Meek, F. W. Belnap, F. Leventhal, J. R. Andrews, C. M. Wales, C. I. Earl, H. Konitzky, H. P. Elwell, F. O. Wellington, Charles Ward, Prof. W. F. Durand, L. H. McMurtie, H. C. Guiler, A. A. Thresher, Naval Constructor Robert Stocker, A. P. Robinson, Wm. F. Palmer, C. D. Mosher, H. L. Fulemeder.

The founder's day exercises of the Thomas S. Clarkson Memorial School of Technology, Potsdam, N. Y., will be held on Friday evening of this week. This institution was founded in 1895 as a memorial to the late Thomas S. Clarkson of Potsdam, N. Y., by his sisters, the Misses Clarkson.

COAST SURVEY STEAMER HYDROGRAPHER.

The steamer Hydrographer, latest addition to the surveying vessels of the coast and geodetic survey, has just been completed and is now at work in Chesapeake bay collecting data for the second edition of United States coast pilot, Atlantic coast, part VI, Chesapeake bay and tributaries. This neat and efficient little steamer was built by the James Reilly Repair & Supply Co. of New York and Philadelphia, who were the only bidders for the vessel at the amount appropriated. She is 101 ft. long, 19½ ft. beam, 9½ ft. depth, and has a mean draught of 5½ ft. when full of coal and water. Her net tonnage is 79.26. For her size she is probably the most efficient steamer afloat, as she carries coal enough to steam 1,600 knots at a speed of 10 knots, and easily makes 11 knots.

The frames are of oak, and planking yellow pine. She is fastened with locust treenails and composition spikes to 1 ft. above the water line, and with galvanized fastenings above. All iron used in her construction is galvanized. She is classed A1 for twelve years by the American bureau of shipping, under whose inspection she was built. She has a triple-expansion engine with cylinders of 9, 13 and 24 in. diameter and 14 in. stroke, with Marshall valve gear, developing 250 H.P.; independent feed and circulating pumps, fire pumps, and feed pump, besides independent feed pump and circulating pump for the evaporator and distiller. The

THE COAST SURVEY STEAMER HYDROGRAPHER.
Built by the James Reilly Repair & Supply Co., New York.

Reilly evaporator has a capacity of 700 gallons of water in 24 hours for the boiler, or 500 gallons capacity for drinking water. The capacity of water tanks is 2,300 gallons.

A Roberts boiler of 250 H.P. supplies steam at 250 lbs. pressure to the engine and 100 lbs. pressure to the auxiliaries. All exhaust steam is trapped to avoid a waste of fresh water. She is propelled by a four-bladed screw 4 ft. 8 in. in diameter, with 7 ft. 8 in. pitch, which made 240 revolutions on the trial trip, and when running 10 knots makes 200 turns.

The Hydrographer embodies some new features for so small a vessel. She carries one 26-ft. whaleboat, one 20-ft. whaleboat, and a 13-ft. dinghey, all of which stow on deck in heavy weather. As she is liable to be sent through inland waters and canals, guards extend along her sides to protect the boat davits. Baldt stockless anchors of 550 and 750 lbs. do duty for the cumbrous anchors and gear usually seen on the bows of vessels. Her complement of five officers and sixteen men have commodious quarters, her berth deck being large, light, well ventilated, and heated by steam, pipe berths allowing a free circulation of air fore-and-aft. The fittings of the cabin are plain but neat, everything else being sacrificed to comfort and convenience for the hydrographic work for which the vessel was built.

The officers now on board are Capt. John Ross, nautical expert, commanding; Mr. H. C. Graves, nautical expert; Mr. H. S. Smith, deck officer, class 1; Mr. Harry Ely, acting chief engineer, and Mr. Talbot O. Pulizzi, clerk. Capt. Ross and Acting Chief Engineer Ely were attached to the Hydrographer while she was being finished by the builders, the others having joined her since to complete her complement for the work upon which she is now employed. The present work of the vessel is the collection of data for the correction and revision of the coast and geodetic survey coast pilot of Chesapeake bay and tributaries, and includes information relating to pilots and where they may be found, best and usual anchorages, depths in the channels, repair and supply facilities, quarantine, harbor and anchorage regulations, and sailing directions. All sailing directions are checked by running the courses with the vessel, and remarks are added relating to lights, buoys, and prominent features which may be of use to the navigator in following the directions. Tables of lights and fog signals, tides, reporting and storm-warning display stations, etc., are included; also the available data relating to tidal currents.

In addition to the data collected while on the vessel, any available information in the office at Washington, including the hydrographic and topographic sheets of the latest surveys, and information from the reports of the corps of engineers, United States army, are included. State and municipal laws relating to pilots and pilotage, quarantine and harbor control; the storm-warning displays of the United States weather bureau; national quarantine laws and the regulations of the United States marine hospital service; and the international and inland rules of the road are included in the coast pilot appendices. The Hydrographer carries a complete hydrographic party and outfit, and an important part of her work is the surveying of waters like Chesapeake bay, where there are large shallow areas, for which she is particularly fitted because of her light draught and general handiness. She is also available for surveying work and special examinations in the shallow inland passages which are found along the Atlantic coast from New York to Florida, and her draught and size permits her to pass inland from the eastern end of Long Island sound to Ocracoke inlet, and from Charleston, S. C., to Fernandina, Fla.

TRAFFIC OF THE KAISER WILHELM CANAL.

Mr. Jackson, secretary of embassy at Berlin, transmits to the state department copies of a pamphlet on the development of traffic in the Kaiser Wilhelm canal. Mr. Jackson notes that the canal dues paid by the United States steamship Enterprise amounted to 400 marks ($95.20) and those of the United States steamship Buffalo to 900 marks ($214.20), which, he adds, would apparently indicate that it is less expensive for our ships to go through the Kaiser Wilhelm canal than to round the Danish peninsula, taking into consideration the saving in time and coal. The total traffic of the canal in 1900, exclusive of ships of the German navy, was 29,571 ships, with a net registered tonnage of 4,292,258. The through traffic for the five years—Jan. 1, 1896, to Dec. 31, 1900—has more than doubled (222.22 per cent.) as regards number of vessels, and almost trebled (269.99 per cent.) as regards tonnage. The canal has given repeated proofs of its capabilities in regard to the number of ships passing in one day. For example, on June 15, 1900, 118 vessels, with 20,649 net registered tonnage, passed the canal, and it has likewise stood the test as regards its navigability for very large vessels, such as the German cruiser Fürst Bismarck and the Japanese cruiser Yakumo; in fact, the average size of the vessels passing the canal has risen from year to year. It has been possible to maintain the traffic without any interruption from ice, even throughout the severe winter of 1896-97, when the sound and the belt were blocked by ice.

SUBSIDIES FROM A SOUTHERN VIEW POINT.

At a gathering of commercial interests in Atlanta, Ga., a few days ago, Senator John L. McLaurin of South Carolina delivered an able address, in which he brought out some important points favorable to ship subsidies. He said:

"We must not imagine that American capital is dependent upon national legislation in order to make ship-owning pay. We have ample evidence of large American investments in foreign-built ships manned and operated by foreigners in our foreign trade. However much our people may have invested in foreign ships, they are unavailable under international law when at war as naval auxiliaries. Another thing we should remember: These very ships and the men employed on board of them may be turned against the United States in the event of our becoming involved in war with the nation whose flag they fly. The object of extending government aid to the up-building of our merchant marine is to secure adequate protection for the nation upon the sea, and the mere fact that the investment has been made attractive to American capital is an incident of the transaction. We do not want to see the isthmian canal become merely a foreign highway of commerce. We do not want our millions expended merely to become a bounty to foreign shipping. It should be an American highway and we should so develop our merchant marine that with the opening of this great canal our own flag shall predominate at the masthead of a majority of the ships that it accommodates."

SCIENTISTS CLASH WITH THE NAVY.

A contest between scientists on one side and naval line officers on the other, which has been waged for years past and involves the control of the naval observatory, has been brought to a crisis by the presentation to Secretary Long of the report of the board of visitors to the observatory. The board is composed of Charles A. Young, Charles F. Chandler, Asaph Hall, Jr., E. P. Pickering, Prof. Ormond Stone and William R. Harper, all men of national reputation in scientific research. The particular bone of contention of late has been a vacancy in the office of astronomical director. Regarding this the board says:

"It is recommended that no astronomical director be appointed at present, as a dual headship has been found to work unsatisfactorily, and under the existing law the appointment of an astronomer as sole director of the observatory—which the board considers the proper solution of the question—is impracticable. Vacancies should not be filled among assistant astronomers nor among professors of mathematics in the navy without examination for each vacancy occurring. In no case should appointments be made to the observatory merely by transfer frome other bureaus or offices in the service, nor should appointments ever be made even temporarily without competitive examination."

The board, therefore, recommends that the appointment of an assistant astronomer be made after a civil service examination under the auspices of the commission. Coming to the more important subject of the actual head of the observatory, the board says:

"As every other prominent observatory is under the direction of an astronomer, we wish to record our deliberate and unanimous judgment that the law limiting the superintendency to a line officer of the navy should be changed so as to provide that the official head of the observatory —perhaps styled simply 'the director'—should be an eminent astronomer appointed by the president by and with the advice and consent of the senate, holding this place by a tenure at least as permanent as that of the superintendent of the coast survey, or the head of the geological survey, and not merely by a detail of two or three years' duration. Only in this way can there be a continuous and effective policy of administration which will insure astronomical work of a high order. The institution should be related to the navy department, if continued under its control, in some such way as the royal observatory at Greenwich is related to the British admiralty. It should be put under the control of the secretary directly, and not through a bureau, as at present."

The board finds objection to the manner in which appropriations have been made in support of the observatory. The cost of maintenance for the last fiscal year was $108,428, of which amount $21,258 was expended in salaries.

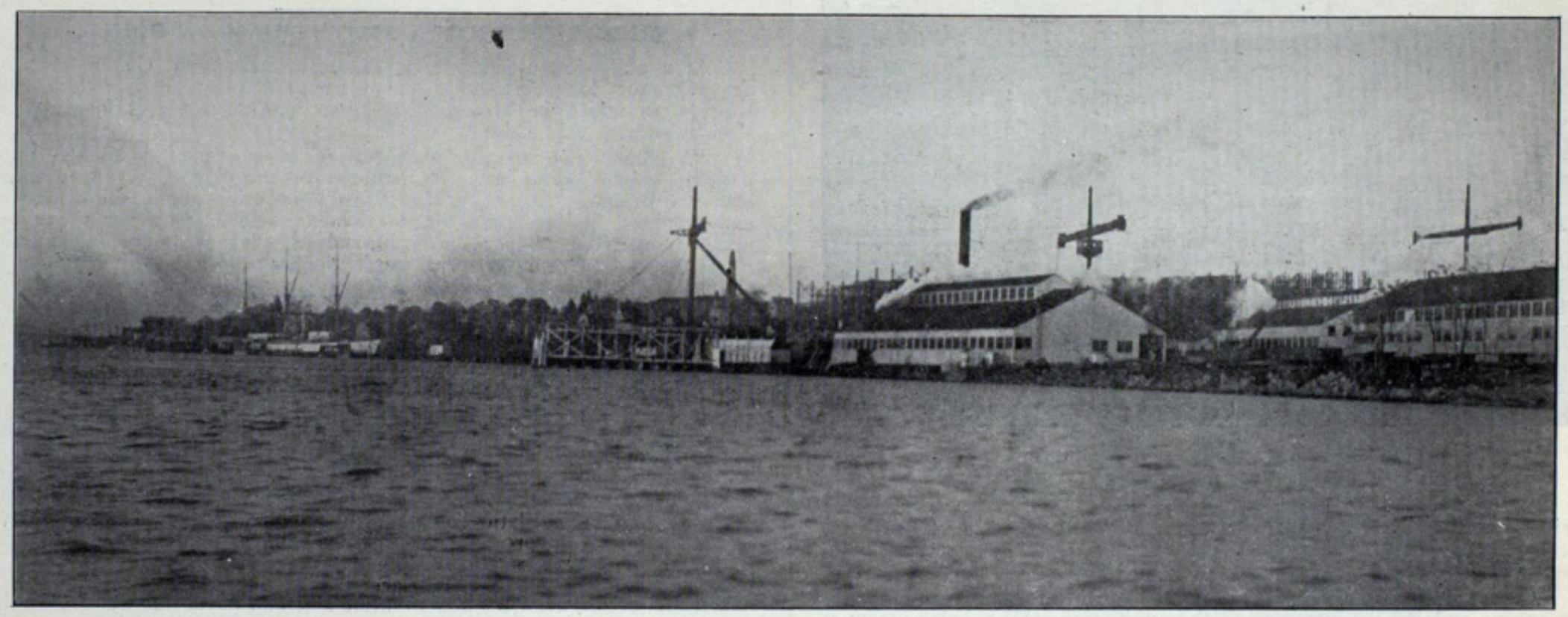
Chicago and return $10.50, via B. & O. R. R., Dec. 2, 3, 4. Call city ticket office, 241 Superior street. Nov. 28.

OVERHEAD TROLLEY SYSTEM AT NEW LONDON, CONN.

The Review has hitherto devoted some space to a description of the overhead trolley system at the yards of the Eastern Ship Building Co., New London, Conn. It is now enabled to go into the subject more fully. The fundamental points to be considered in the design of a successful system for handling material over ship building ways are: First, complete immunity from accidents which endanger life and property; second, a simple and rapid arrangement for hoisting, distributing and locating material where desired in any part of a vessel building. Speed of working is, of course, one of the most essential features, and the most successful overhead traveling crane or trolley system for ship building purposes is naturally the one that will hoist, arrange or put in position the greatest number of pieces of material or the greatest tonnage in any stated time. In this respect the managers of the New London works feel that they have a most efficient system. It is an entirely novel and original scheme for handling material over ship building ways. It was conceived by President Hanscom, he having previously utilized a somewhat similar principle in a much smaller and simpler way in other establishments where he was, as a prominent official, connected for several years.

This trolley system consists of three vertical masts erected between the ships, one at the bow, one at the stern and the third or central one midway between the other two. These masts are each about 140 ft. high respectively from foot to cap, and they rest upon immense foundations. To each mast is fixed a large horizontal yard, rectangular in section, and built as light as consistent with required strength. The yards are situated on the masts at a height of about 90 ft. from the ground, and at sufficient height above the highest point of vessels under construction so that long heavy plates or beams can be carried with ease and very rapidly to any part of the vessel desired. The masts are securely stayed in fore-and-aft directions by strong steel wire stays or guys, securely anchored in rock. In addition to the water-end stay the after mast is held in position by a steel strut or compression strong-back. Steadiness in athwartship direction is obtained by steel guys, similar to those forward and aft, running from the ends of the yards, and these are also securely anchored in rock. A strong fore-and-aft steel wire stay connects the end and middle of each yard, and diagonal wire rope guys run from the ends of each yard to each mast. The yards are supported from the masthead by large steel wire guys or lifts, and the two end yards are well braced and trussed with heavy wire rope tension guys. The working field of the trolleys is a large rectangle, 600 ft. by 175 ft., supported over the vessels and securely held in position by masts and guys.

Material can be carried to any position in the rectangular field by means of fore-and-aft traveling carriages on thwartship moving cables suspended between cars running on tracks on top of the yards. The motion to the cars and carriage is obtained from electrically-operated machinery, which was also built and designed by the Eastern Ship Building Co., contained in a house, or operating station, located on the middle mast just under its cross yard. This house is supported by immense brackets securely attached to the mast, similar to a "fighting top" on the mast of a war ship. The electrical operators of the machinery in the station house are constantly in full view of their field of work. The system possesses many advantages. Its principal advantage is its flexibility and the very large number of usages to which the frame work and guys of the structure can be placed. Such a system could be designed to take any number of traveling trolleys, each having transverse and longitudinal motion, whereas other systems confine the number of hoists made at the same time to one or two. The system now in successful operation at New London is designed for four traveling trolleys at work simultaneously each, with one of the heaviest members that enter into the construction of the largest vessels ever built or projected. The practical working of the system has clearly demonstrated its superior worth. It might be of interest to quote Prof. Von Halle of Berlin, Germany, who, after having inspected all the prominent American ship yards, just before his return to Germany, said during an interview in Yew York: "The overhead system of handling material at the works of the Eastern Ship Building Co., New London, is the great feature of the most remarkable ship yard in the world."



VIEW OF EASTERN SHIP BUILDING CO.'S WORKS, NEW LONDON, CONN.

For navigation charts apply to the Marine Review.

AMERICAN MERCHANT MARINE ON THE OCEANS.

Editor Marine Review: The undisputed facts, as contrasted with the many theories respecting the ocean merchant marine, appear to be these:

First—Ocean freights on articles of export and import from and to ports of the United States amount to $200,000,000 more or less, annually.

Second—In the last fiscal year about 8 per cent. of this amount, or $16,000,000, was paid to United States vessels, while the remaining $184,000,000 was paid to foreign vessel owners.

Third—Our citizens do not build, own and operate vessels in the foreign trade because they cannot do so with profit under existing competitive conditions.

Fourth—The competitive disadvantages to which our citizens are subjected cannot be determined with exact mathematical accuracy, but they have been carefully studied and approximatively estimated with an accuracy sufficient for business guidance.

Fifth—The United States requires a merchant ocean marine and prosperous ship building industries for the security of the country in time of war.

These are believed to be undisputed facts and the queries they suggest are whether, as a nation, we need and must have ship building industries and ocean vessels as essential to our safety and welfare in peace and in war. If we decide, as a people, that we need and must have ship yards and ships, it only remains to decide what we must pay to secure them. Our past experience shows that we cannot obtain an ocean marine relying simply upon the chance of profit from the business. There are many minds at work upon this problem. Some are trying to consider it calmly, judiciously, as a great national non-political question. Others, unfortunately, are less unselfish and regard it as a question out of which useful political capital may be made. Others are disturbed because money is to be paid out of the national treasury and received by the citizens who may be thus induced to own and operate merchant ships upon the oceans, forgetting that governments like individuals must pay for the service they need.

It is impossible, of course, that everyone, ready with an opinion upon this complex question, shall have given it any really thorough and valuable study, without which no opinion can be useful. One after another various impracticable propositions have been presented, considered and abandoned.

We have slowly but surely been obliged to accept it as a fact that if the nation wants a merchant marine it must be prepared to pay a reasonable and necessary consideration to obtain it, and that this payment must take the form of a direct subsidy or bounty to those who are willing to undertake to render the service. If the amount of the payment is too small to meet the competitive conditions the service cannot and will not continue to be rendered. It is not an occasion for a false petty economy. If the amount of the payment proves to be large enough to give vessel owners an undue profit, competition will be sure to return the excess to our people in reduced rates of ocean freights. It is for the people to decide through their president and representatives in congress whether there shall be a reasonably liberal subsidy paid and a national merchant marine created and sustained on the oceans; or the effort to enact subsidy legislation defeated and our ocean carrying abandoned to the vessel owners of foreign nations.

While the question is important from a commercial point of view it is vastly more important on the score of national independence and safety in time of war.

FRANK J. FIRTH.

Philadelphia, Nov. 26, 1901.

Canada's department of public works has completed estimates for the proposed 20-ft. navigation between Georgian bay and Lake Nipissing. The total cost is placed at $4,000,000. It is proposed to make connection at Callender with the Grand Trunk, and at Northern bay with the Canadian Pacific. Minister Tarte, referring to the matter, said that within the next few years the export of grain from Manitoba and the Northwest territories alone would be 100,000,000 bushels, and the only way to prevent its being diverted to American channels is to complete the above short route through Canada. An increase of $7,000,000 in the aggregate foreign trade of Canada for the first four months of the present fiscal year ending Oct. 31 over the corresponding period last year is reported by the customs department.

DEATH OF DAVID CARTER.

Mr. David Carter, secretary and general manager of the Detroit & Cleveland Navigation Co., died last Thursday afternoon at his home in Detroit. He was born in Cleveland, Feb. 27, 1832. He first worked on his father's farm in St. Clair county and afterwards clerked, in 1845, in a lumber yard in Sandusky for his board and clothes. In 1846 he was employed on the lakes, beginning as ship's cook. In 1851 he left the lakes and in a short time became cashier of the Mad River railroad docks at Sandusky. Later he went to Detroit where he again took to the lakes. At the age of twenty he began as a clerk on the propeller Forest City his career of half a century with the D. & C. line. Mr. Carter saw this line grow from a small beginning to one of the largest navigation companies on the lakes.

The Lake Carriers' Association adopted the following resolution in memory of Mr. Carter:

"The members of the Lake Carriers' Association, many of whom were life-long, personal friends of David Carter of Detroit, learn with deep regret of his death, and in consonance with the esteem and personal regard in which he was held by all, record is here made. His long connection with the marine interests of the lakes made him known to all, and brought him into close, personal association with many of us. No one was held in more kindly regard; the judgment of none carried greater weight in the councils called from time to time in the common interest of all. By his death we lose a clear-minded, reliable, consistent associate; a kindly, considerate, trustful friend. At all times, in all places, and to all men, he was a whole-souled, conscientious, tolerant, Christian gentleman. Therefore be it

"Resolved, that we, as friends and associates of the deceased, hereby make due acknowledgement of our loss and extend to the widow and family of the deceased our sympathy in their greatest loss. That a committee of this association attend the burial services and that as many of the members attend as may be able, and that all vessels belonging to the association fly their colors at half-mast on Saturday Nov. 23, 1901. That a record of this memorial be made upon the books of the association and copies transmitted to the family of the deceased and to the Detroit & Cleveland Navigation Co., to which and its predecessor he gave long, continuous, progressive endeavor."

Messrs. T. F. Newman, John Mitchell, Harvey D. Goulder and H. Coulby were appointed a committee to attend the funeral of Mr. Carter on behalf of the association. The funeral was held in Detroit on Saturday.

SUCCESSFUL TEST OF THE FULTON.

The new Holland submarine boat Fulton was given a severe test at New Suffolk last Saturday, which seems to have been successful in every particular. She was submerged from Saturday evening until Sunday morning with the following on board: Rear Admiral John Lowe, retired; Lieut. Arthur McArthur, commander of the torpedo boat Winslow; Capt. Frank T. Cable, navigator for the Holland company; John Wilson, machinist; John Saunders, engineer, and Henry Morrell, electrician. The heavy iron hatch was closed over them and after it was securely fastened the Fulton sank slowly, steadily and evenly out of sight. Before going down the men had eaten a hearty dinner and had with them their lunch and breakfast. At 10:30 o'clock Sunday morning the Fulton arose from the bottom, upon which she had been resting all night, with a suddenness which startled those who had been watching through the night. Admiral Lowe said:

"Well, I have had a fine night's rest and feel just as well as if I had been ashore in usual surroundings. The air in the ship appears to be now about as good as when we went on board last evening, much purer than you will find in any New York city court room. We might have stayed down a great deal longer. Really, I don't know how long, for little of the air in storage was used. I must have slept about ten hours out of the fifteen we were under. The boat is all right."

Capt. Cable said: "The Fulton settled evenly to the bottom and rested there without motion till she was lifted this morning. There was no motion to her to indicate the severe storm passing over. The men were divided into four-hour watches for the night and then amused themselves by playing euchre, reading the new magazines and papers and spinning yarns. Not a valve was touched during the test. The Fulton goes to Washington this week by the outside route."

Commanders Nishi and Sata and Lieut. Ide of the royal Japanese navy, who witnessed the trial of the boat, declared they would recommend the adoption of the boat by the Japanese navy.

TURRET QUESTION SETTLED AGAIN.

The heated controversy in the naval board of construction over the question of recommending the installation of ordinary turrets or superposed turrets on the battleships which Secretary Long will ask congress to authorize has been amicably adjusted. A compromise was effected by which the ships will have ordinary turrets as recommended by the majority of the board, but certain features of the battery advocated by the minority will be adopted. The report of the board will be unanimous. Unanimity was made possible by Rear Admiral R. B. Bradford, chief of the bureau of equipment. For a long time he was the only member of the board who held out for turrets of the superposed, or two-story type, and he has been successful in getting the department to sustain his views, despite the adverse vote against him. Recently he had been joined by Capt. Charles D. Sigsbee, chief naval intelligence officer and the junior member of the board. Appreciating, apparently, the danger of confronting the naval committee of both houses with a divided opinion among the naval experts, thus giving congress the opportunity of devising a battery arrangement of its own, Admiral Bradford proposed a compromise. He agreed to withdraw his advocacy of the superposed type if the majority would come over to his views in regard to other features of the main battery. After much discussion this was agreed to, and at the next meeting of the board the arrangement will be formally adopted. The plan agreed on will embrace four 12-in. rifles in two ordinary turrets, one forward and the other aft, and a heavy battery of eights, sevens and sixes. Some of these guns will be placed in turrets, but the exact arrangement of the several calibers cannot be ascertained, owing to the secrecy observed by members of the board.

ADMIRAL O'NEIL ON THE GATHMANN GUN.

Rear Admiral Charles O'Neil, chief of the bureau of ordnance, says that the test of the Gathmann shell and 18-in. gun fully sustained the opinion held by ordnance experts of both army and navy, that any large amount of gun-cotton exploded against the sides of the heaviest armored battleship would have little effect on the vessel or crew. He said he regarded the tests as a great triumph for army ordnance in demonstrating that the new 12-in. coast defence gun is capable of carrying a projectile containing high explosive through the side of any battleship afloat and can be fired with absolute precision by the accurate time fuse employed. The navy gun of the same caliber was equal, he said, to even more destructive work. The admiral said:

"The government has expended about a quarter of a million dollars on the Gathmann gun trials, which have shown nothing that the naval ordnance officers did not know all along. For six years experiments have been conducted with this system and three years ago the trials with another gun on the same general principle as the one employed at Sandy Hook, though smaller, gave results that then were accepted by ordnance men as clearly proving the non-utility of the system. The navy has now, after several years, obtained a high explosive, the secret of which we do not care to divulge. It can be fired, however, in a projectile through any side armor afloat and exploded with accuracy and precision in the interior of the ship. Its effect on both ship and crew would be most destructive. The explosive is not gunpowder, which, as we have known for years could be carried through a vessel's side and exploded. One of the difficulties to be overcome in firing high explosives in projectiles has been to secure a fuse that would detonate the charge at the right time. This we have at last secured. The army gun has amply shown that eleven or more inches of the best armor can be easily penetrated with an explosive shell and this at a range usually regarded as one that most vessels would employ in actual battle."

PLANS FOR POWERFUL SHIPS OF WAR.

The plans for the two largest and most powerful battleships projected for the United States navy were completed by the naval board of construction this week. These are the vessels which congress directed the navy department to design and the plans will be sent to the naval committees of the senate and the house at an early day with a recommendation from Secretary Long that authority be given to build them and an additional one of similar type. Each of these ships will have a trial displacement of 16,500 tons. The only war vessels of greater displacement are some recently laid down by England. These will displace 17,500 tons of water. It was hoped by the board on construction that a ship capable of making 19 knots could be designed, but this was found to be impossible without lengthening her considerably. The engines will be capable of providing 18 knots speed.

The main battery is powerful, consisting of twenty-eight guns of long range and great power. It is not wholly satisfactory to the members of the board on account of containing four different calibers, thus increasing the ammunition problem. No better arrangement, however, could be reached by the board to effect a compromise that would enable it to submit a unanimous report. The majority wanted no 8-in. guns, and advocated the use of the new 7-in. guns without turrets. The minority, by abandoning its advocacy of superposed turrets, induced the majority to consent to the installation of eight 8-in. guns in turrets, but broadsides of sevens were also provided for. The biggest guns of the battery will be four 12-in. rifles in two ordinary turrets, one forward and the other aft. The eight 8-in. rifles will be placed in four turrets, two rifles in each. One of these four turrets will be at each corner of a quadrilateral citadel containing the 7-in. guns. There will be twelve of the sevens, protected by the armored walls of the citadel, six guns to the broadside. Then there will be four 6-in. rapid-fire rifles on the superstructure.

CONTRACTS FOR TANK STEAMERS.

Evidently the Standard Oil Co., as well as the new companies engaged in developing the oil district of Texas, is badly in need of tank vessels for the oil trade and wants them as soon as possible. The great lakes have been searched for vessels suitable to conversion into tankers and three or four have been taken to the Atlantic seaboard. Of course the requirements of the Standard may have reference to the oil trade as a whole and not particularly to increased business on account of the Texas field. The big corporation has just closed contracts with several ship yards for tank steamers and barges. The Cramps at Philadelphia have received an order to construct a tank steamer, the Townsend & Downey Ship Building & Repair Co., Shooter's Island, N. Y., an order for two tank steamers, and Arthur Sewall & Co., Bath, Me., an order for a barge. The steamers are to be 360 ft. long, 50 ft. beam and 29 ft. deep and to have capacity for about 6,000 tons of oil. The barge will be 293 ft. long. It is understood also that the William R. Trigg Co., Richmond, Va., is to receive a contract for a steamer.

DRY DOCK AT BALTIMORE DEDICATED.

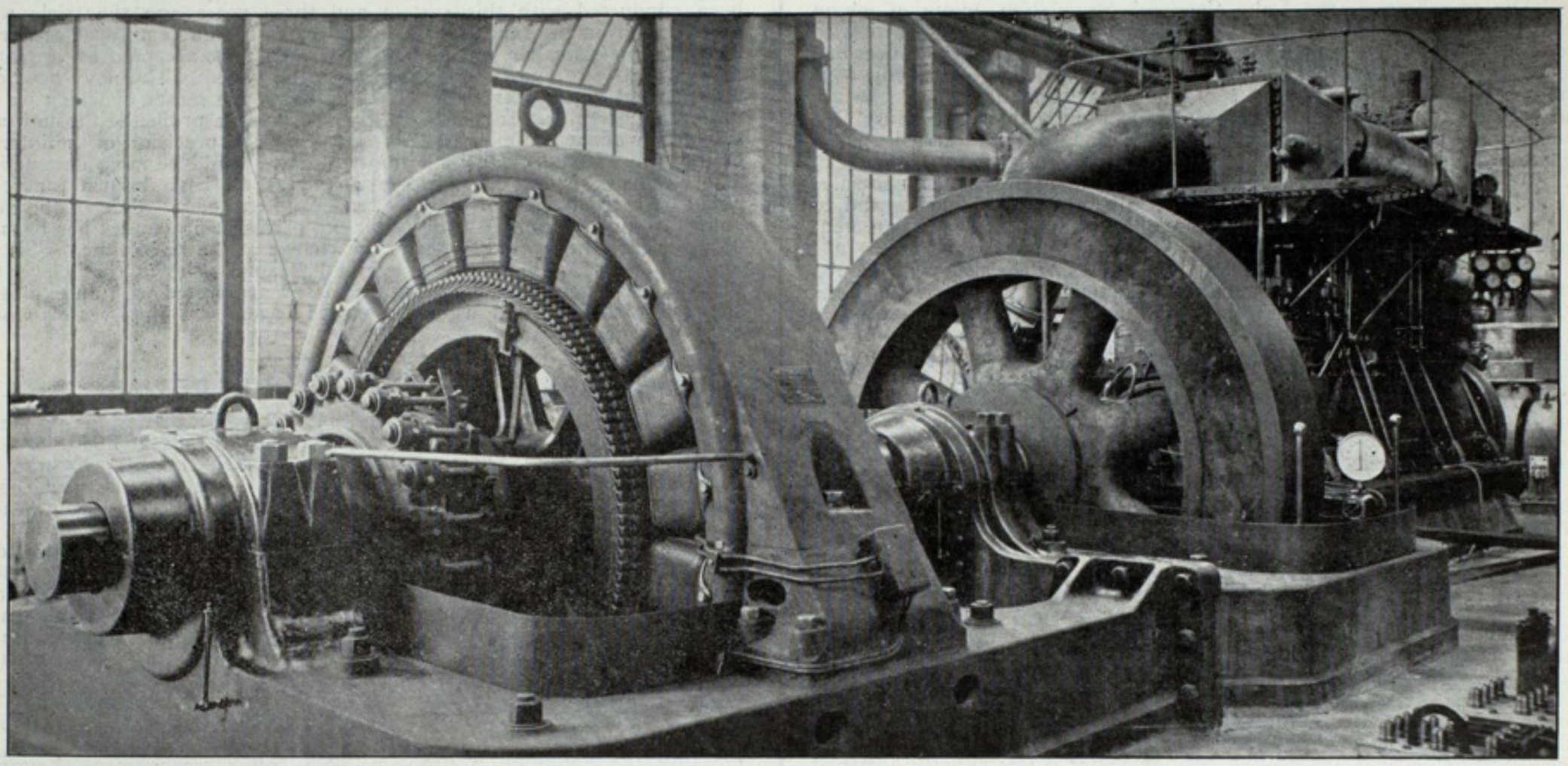
The new dry dock of William Skinner & Sons Ship Building & Dry Dock Co., Baltimore, Md., was opened with public ceremonies on Monday. The principal dimensions of the dock are: Length over all, 628 ft.; width on floor, 62 ft.; width at top of keel blocks, 69 ft.; width at top of dock, 125 ft.; entrance at bottom, 60 ft.; entrance a top, 80 ft.; depth of water on sill at low water, 22½ ft.; depth of water on sill at high water, 25 ft. With the exception of the dry dock of the Newport News company it is the largest of its kind in the United States. Among those who were present at the exercises were Secretary John D. Long of the navy department; Rear Admiral M. T. Endicott, chief of the bureau of yards and docks; Rear Admiral Bowles, chief of the bureau of construction; Gen. James A. Dumont, of the steamboat inspection service; Capt. C. A. Shoemaker, chief of the revenue cutter service, and Eugene Tyler Chamberlain, commissioner of navigation.

Henry Wineman, Jr., of Detroit has purchased from E. D. Carter of Erie, Pa., the steamer Tampa and consort Aurora, one of the best wooden tows on the great lakes. He takes possession of the vessels at once.

AN UP-TO-DATE SCOTCH SHIP YARD.

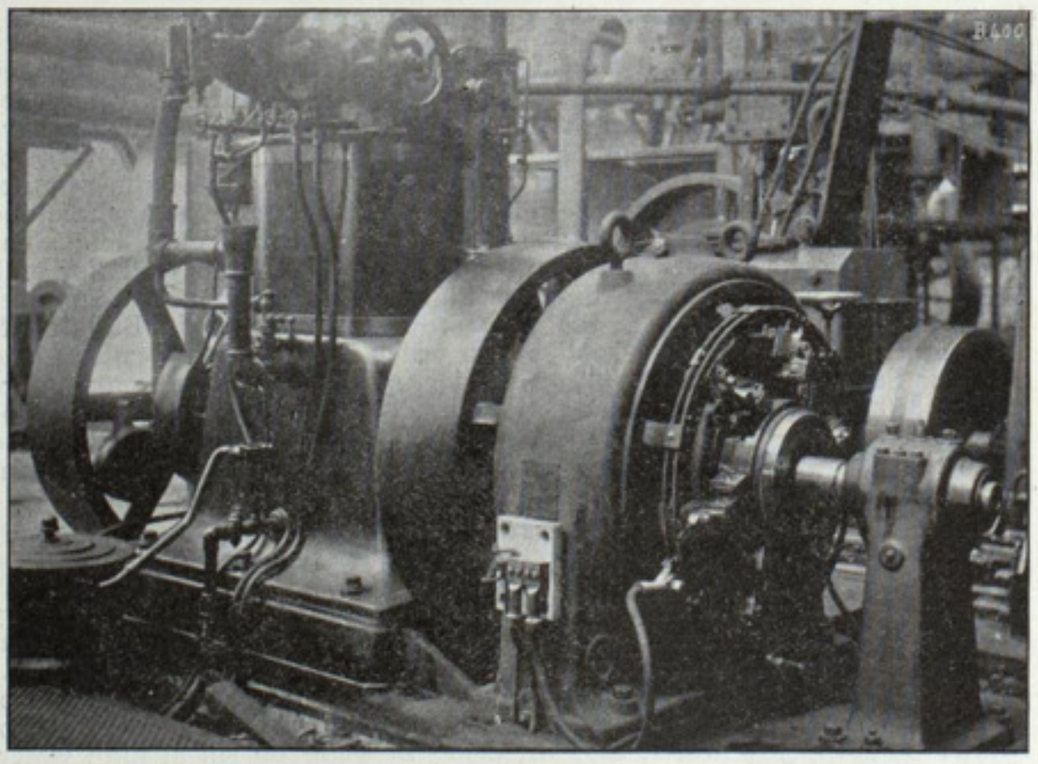
DESCRIPTION OF COMPLETE ELECTRICAL EQUIPMENT FURNISHED BY THE WESTINGHOUSE COMPANY TO A LARGE SCOTCH WORKS.

The Palmer Ship Building & Iron Co., Jarrow-on-Tyne, Scotland, is one of the oldest and best known engineering concerns in the world. The company's works are very complete and include everything from blast furnaces to machine shops, thus making it possible to carry out the building of vessels from the iron ore to the perfectly finished ocean-going steamer. The ship building department and the engine department have recently been equipped with electric apparatus for power distribution. Formerly banks of Lancashire boilers were located at various points in the works and they were fed by an extensive system of steam mains and a great number of small steam engines. In the shops the engines were mostly of the wall type, each driving by belt a long length of overhead shafting. In the yards the individual machines were for the most part driven each by an independent engine fed by underground steam mains. The greater part of the boiler plant being old and the necessity for a new power plant equipment urgent, it was decided to adopt electrical driving, and Messrs. Clark, Chapman & Co. of Gateshead-on-Tyne were called upon to carry out the new arrangement and provide the requisite apparatus.



THREE-PHASE GENERATOR OF 750 KW. CAPACITY, DIRECT CONNECTED TO STEAM ENGINE.

At the time when the new power plant was most required the works were exceedingly busy and the system chosen was that in which the installation would interfere as little as possible with the continuous output of the works. The long lengths of shafting and the numerous belts and pulleys were practically retained in their entirety, the steam engines being replaced by an electric motor and the steam centralized at one point in the electric generating station. With this arrangement the economies resulting from the change were at once apparent. Although no definite comparative tests have yet been taken, there is a considerable reduction in the quantity of fuel consumed for power generation.



ENGINE TYPE GENERATORS DIRECT CONNECTED TO WESTINGHOUSE COMPOUND ENGINE.

The power plant is located in an independent building, a dividing wall across the center separating the boiler plant from the engines and generators. In the boiler house there are installed four Lancashire boilers working at a pressure of 150 lbs.per square inch. Three of these boilers are kept constantly in use for the power load. They are hand-fired. The two feed-pumps are of the vertical, high-pressure type (Woodeson's patent), manufactured by Messrs. Clark, Chapman & Co. With the exception of driving these pumps and a small engine working the economizer scrapers, the whole of the steam generated at the power house is used for driving the electric generating sets. There are two generating units. Each generating set consists of a triple-expansion, open type, marine engine of about 1,000 H.P. operating in conjunction with a condensing plant and direct-coupled to a Westinghouse three-phase alternator, delivering 750 KW. at a pressure of 440 volts. The flywheel, 11 ft. in diameter and weighing 22 tons, is set on two bearings between the engine and the alternator, and a flexible coupling connects the engine and the flywheel. The speed of the generating set is 160 revolutions per minute. The alternators are of the rotating armature type. The field consists of a ring bearing twenty-two internally projecting pole-pieces. The latter are built up of thin, soft-steel stampings, which are cast in the ring, thus ensuring a most efficient magnetic circuit and rigid mechanical construction. The field ring is horizontally divided through the center, giving ample facilities for the inspection of the armature and the field windings.

The armature is built up on a cast-iron spider and is of the iron-clad type, the conductors being buried in slots below the periphery of the laminated core. For exciting the fields of the two large generators, two small direct-current generators are installed. Each of these is a self-contained unit, consisting of a Westinghouse compound steam engine direct-coupled to a multipolar, direct-current generator. The two sets are of the same capacity, each engine having cylinders 8 in. and 13 in. in diameter, respectively, and a stroke of 8 in. The Westinghouse compound engine has single-acting cylinders and only one steam valve which works horizontally across the upper ends of the two vertical cylinders. The two side-by-side cylinders form one single, simple casting, the lower flanges of the cylinders resting on the crank case, and carrying on the upper flanges the steam chest, which also is a simple casting. The cylinders are double-walled to prevent condensation and are smooth and free from ports or passages of any kind throughout their lengths. The shaft of the engine is extended beyond the crank-case bearing, at the opposite end from the valve eccentric and governor wheel, to an outer bearing. This extension carries the flywheel and the generator armature, the engine and the generator both being set on one cast-iron bed-plate. Each of the exciter generators installed has a capacity of 25 KW. at 250 volts running at a normal speed of 375 revolutions per minute and is capable of providing exciting current for the two main generators together.

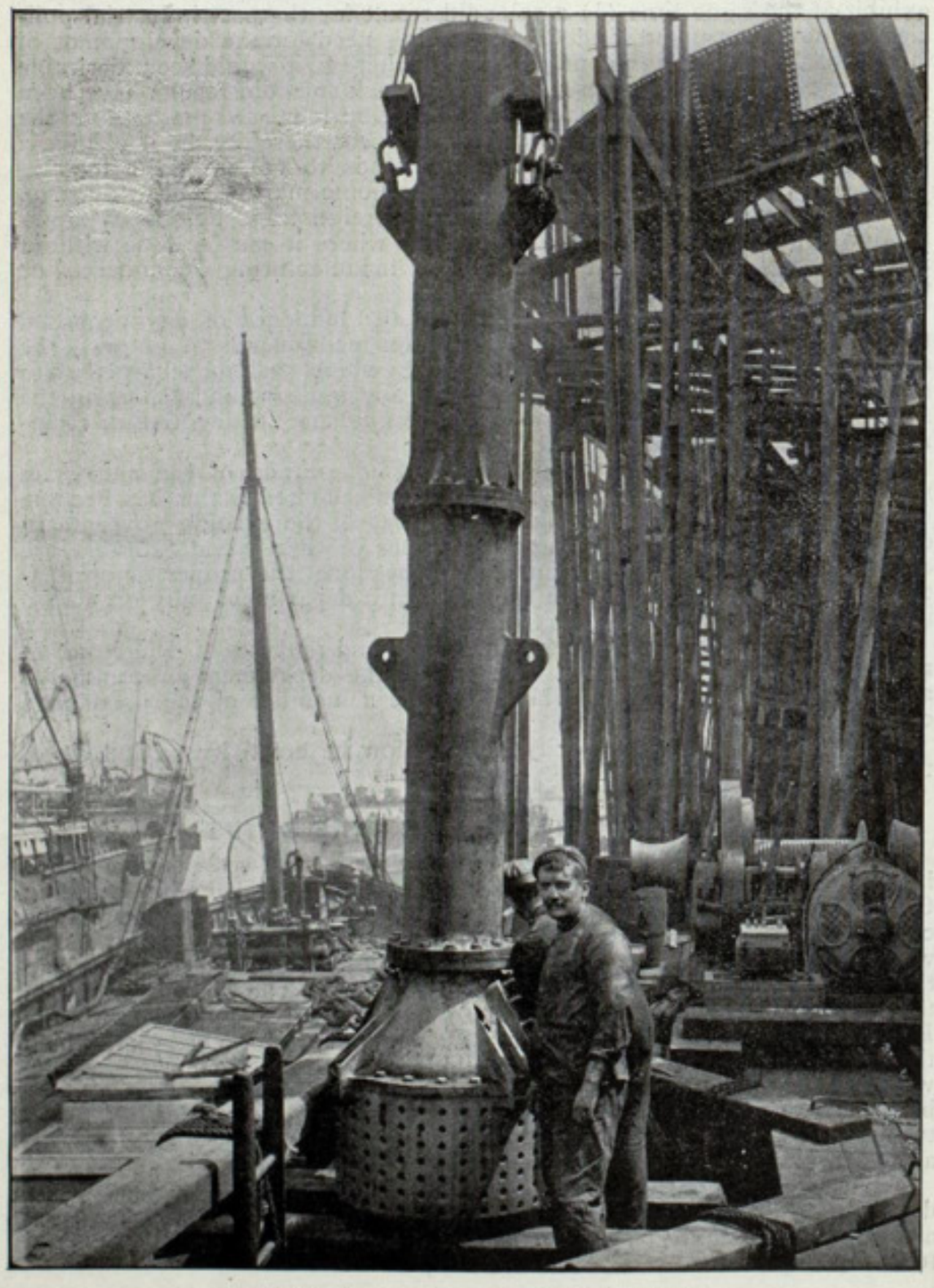
The main switchboard is located in the power house. It consists of five marble panels—one exciter panel, two generator panels and two feeder panels. Provision is made for the parallel running of the alternators. Above the switch panels are four fuse blocks arranged in sets of three, placed in the generator circuits. The switchboard is of similar manufacture to the generating plant, and the instruments, switches and general construction are in accordance with the well-known principles of Westinghouse practice. The distributing circuits, with two exceptions, all branch from two large main feeders, one feeding the engine department and the other the ship yard department. The smaller independent circuits run from the engine department panel, one to an auxiliary board in the power station, the other to a pair of electrically-driven centrifugal pumps situated about 80 yards away in a small shed by the water side. These pumps are each direct-coupled to a 40 H.P. induction motor and draw water from the river for the main engine condensing plant. The lift at low water is about 15 ft., with a rise at the condenser of 10 ft. more. The motor-starting switches are arranged alongside of the motors. One set is sufficient to provide for a maximum load on the engines and the practice is to run each continuously on alternate days. The auxiliary board in the power house has, in addition to the main switch in circuit with the feeder

from the main board, five motor-circuit switches. One of these is in circuit with a pair of 50 H.P. motors, each operating a dry dock centrifugal pump by a downward vertical belt drive about 20 ft. deep. Another switch is in circuit with a 20 H.P. motor operating a winch for lifting stern posts, etc. Other switches are in circuit with two 8 H.P. motors operating winches for lifting material aboard, and another is in circuit with a portable stern-tube boring gear of about 8 H.P. These pumps, winches and boring gear are all located near the power house.

The engine department feeder is a three-core cable .33 square inch conductor, running directly without break to the machine shop of the department. The feeder ends in a large switchboard panel where, through a 1,000 ampere switch, are fed a set of bus bars, from which, through five other switches, branch feeders to the distributing boards. There are in all five of these feeders, the boards being placed at convenient centers in the department.

In the machine shop one 30 H.P. motor set on the ground drives 90 ft. length of overhead shafting. The speed is 860 revolutions per minute, the drive being by a belt 9 in. wide onto a pulley on the end of the shaft. Connected with the shaft are about twenty small lathes and slotting machines. One 15 H.P. motor running at 570 revolutions per minute drives by belt a fan running at 800 revolutions per minute, providing draft for the smithy hearths. A 20 H.P. motor hung on its side to a column of the building drives a length of shafting in the machine shop extension operating several large planers, band-saws and milling machines. In the machine shop extension there is also a 10 H.P. motor driving a very large boring mill. This motor is hung on the wall and drives the mill by belts and countershaft. A 25 H.P. motor drives the length of shafting operating some thirty machine tools in the middle and lower bays of the machine shop. There is also a 30 H.P. motor driving lathes that range from 4½ ft. center downwards, and one 20 H.P. motor driving shafting. Two of the overhead traveling cranes of the machine shop are being converted to single motor electric cranes and two other three-motor cranes are being installed. Just outside the machine shop is an electric winch driven by an 8 H.P. motor through a worm and pinion gearing. The winch has two warp ends and a barrel and is used for hauling purposes.

In the erecting shop the distributing switchboard has thirteen motor switches in addition to the main switch. There are installed a 15 H.P. motor driving a large planing machine and two large lathes; a 10 H.P.

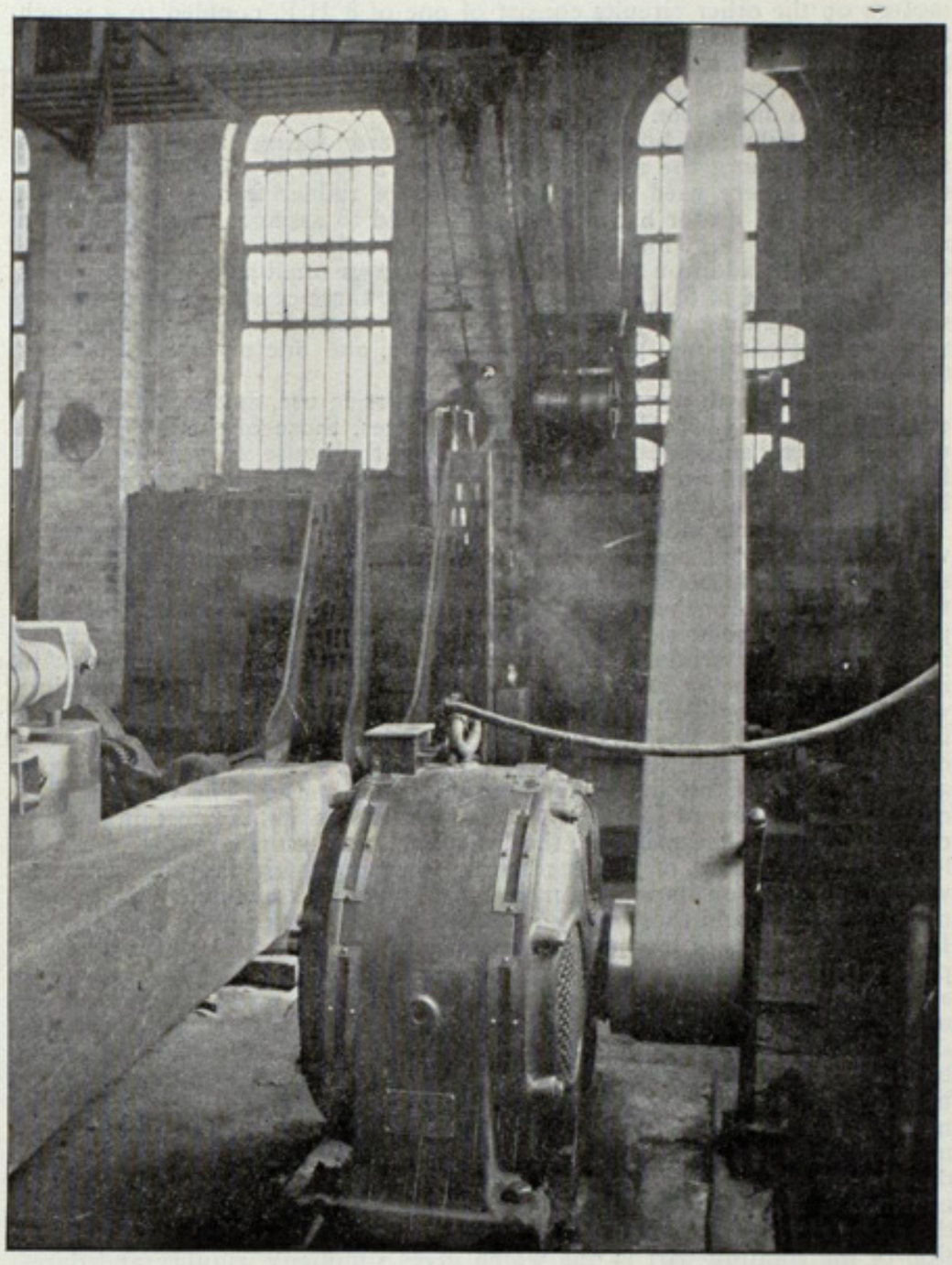


TYPE "C" MOTOR OPERATING WINCH.

motor driving a large milling machine; another 10 H.P. motor driving by a length of overhead shafting several large lathes; a 40 H.P. motor driving by a belt and countershafting an electric arc lighting machine; and a 30 H.P. motor, coupled by belt to the overhead shafting throughout the length of the erecting shop, drives, among other machines, several large side and vertical planers. From this board in the erecting shop there run also the circuits for a 30 H.P. motor driving the whole of the plant in an independent shop, known as the top-fitting shop, and also circuits for a 15 H.P. motor driving all the machine tools in the brass machine shop. The pattern shop is to be fitted with a 30 H.P. motor, and in the yard a winch for metal breaking is to be installed, both of which are also to be fed from the same board.

Another distributing board is located in the foundry. It has five motor-circuit switches together with the usual main switch. In the foundry proper are installed two 50 H.P. motors, one hanging from the roof, driving two blowers, and the other, on the ground, driving two sand mills. A 20 H.P. motor is also fitted up for driving three 20-ton cranes. There are in all six cranes, three in each bay; and all are to be fitted eventually with independent motors from the board in the foundry. Circuits are run to two motors in the copper shop, each of 20 H.P. capacity, one driving a fan, the other the shafting. Another circuit runs to a 15 H.P. motor driving small machine tools in the jetty fitting shop.

The other main feeder from the power station supplies current for the whole of the ship building department. It runs direct to a switchboard



TYPE "C" ALTERNATING MOTOR DRIVING SHAFTING.

in the No. 2 shed, where all the plate work is carried out. Here it is divided into five circuits, four of which pass directly to other boards at convenient centers for the sub-division of the current to the various motors. An ammeter is placed on the board in each of these four circuits. The fifth switch is in circuit with the two 50 H.P. motors which operate shafting, driving the punching, shearing, planing, bending and rolling machinery in shed No. 2, and also operate by an extension of the shafting two sets of hot rolls, 9 in. by 9 ft. and 17 in. by 12 ft. in No. 3 shed.

On the other four circuits one leads to a sub-dividing board alongside, where current is received through a main switch and divided into eight distinct motor circuits, each with an isolating switch on the board. One circuit feeds a 30 H.P. motor, providing power for half of the plant in shed No. 1, where plate work, such as rolling, punching, sawing, grinding, drilling, etc., is undertaken. Other motors, fed direct from this board, are two of 20 H.P. each, driving a winch for lifting material to vessels on the stocks, and four of 8 H.P., driving winches for similar work. From the main distributing board a circuit runs to a distributing board in the shed, where angle-iron bending, punching, shearing, etc., is done by separately driven machines. The circuits from this board are led to motors as follows: One 30 H.P. motor driving by belt and countershaft an air compressor for a riveting machine; one 10 H. P. motor operating a large tool which shears 1¼ in. material and punches up to 12 in. in diameter; a 5 H.P. motor driving by belt a horizontal angle bar cutter and squeezers; three 5 H.P motors, two pinion geared and one belt, driving combined shears and punches; one 5 H.P. motor driving by belt a portable angle bar beveller; a 5 H.P. motor driving by belt a horizontal squeezer; a 15 H.P. motor driving by belt a circular fan for the smiths' fires. tributing board is also fixed in shed No. 1, having six motor s a main switch. A 30 H.P. motor (in addition to the pr tioned, connected with the board in shed No. 2), driv shafting operating the remainder of the plant in shed also one 10 H.P. motor driving the plant in the pl cipally pipe cutting and screwing machines, and th shop, principally circular and band saws; two 15 H for smiths' fires in shed No. 1 and three 8 H.P. and pinion gears to winches, one in shed No. 3 heavy forgings on trucks, one for hoisting materia for general lifting at the jetty side.

Two cables enter the joiners' shop and termin

boards. One of these is fitted with three motor switches and a main switch, the other with two motor switches and a main switch. The motors connected with the first board are two of 40 H.P. each driving a length of overhead shafting for operating saws, planers, etc., and one of 15 H.P. operating a jib crane for lifting heavy timbers. The two motors connected to the other board are of 30 H.P. each and they are coupled together, driving by belt a large frame saw and other wood-working machinery. A distributing board is installed for splitting up the circuits for the various machine tools distributed about the yard. There are in all thirteen switches, including the main switch on this board, together with two ammeters, one of which indicates the total current coming to the board, the other indicating the current passed along through one of the switches to another distributing board in the ship yard fitting shop. The motors on the other circuits consist of one of 8 H.P. coupled to a winch for hauling vessels into dock; seven of 5 H.P. each driving combined punches and shears, two belt driven, the rest pinion-geared; one of 5 H.P. operating horizontal squeezers, and one of 5 H.P. operating a combined squeezer and angle-iron cutter.

The distributing board in the ship yard fitting shop has eleven switches, including the main switch. Here a 50 H.P. motor is installed, driving machinery used in the production of rudder frames, stern posts, etc. A 30 H.P. motor has also been installed to assist at this work when required. A 40 H.P. motor drives the overhead shafting for running circular saws. In addition to these, there are seven small motors used in this department—one of 5 H.P. driving squeezers, three of 8 H.P. each driving winches for hauling purposes, two of 5 H.P. each driving by pinion and spur-gearing combined punchers and shears, and one of 10 H.P. driving the fan for a small forge.

There are in all upwards of eighty motors in use, aggregating a total capacity of over 1,500 H.P. The largest sizes, those of the 20 H.P. and upwards, were supplied by the British Westinghouse Electric & Manufacturing Co., and are of their well-known type "C;" the rest were built by Messrs. Clark, Chapman & Co., under Westinghouse license.

The polyphase induction motor has two main elements—the primary, which is fixed and receives the current from the main supply, and the secondary, which is the rotating part and is not connected to any electrical circuit. The windings of the primary are so arranged that the polyphase current produces in it a rotating magnetic field. The rotation of the secondary is produced by the induction of low-pressure currents in its closed circuits by the magnetic field of the primary. This principle was discovered by Tesla, and the patents covering it are all under Westinghouse control. There is no doubt that the present universal adoption of alternating current for all power purposes owes more to the discovery and perfection of this motor than to any other cause. The extreme mechanical simplicity of the type "C" motor is one of its most important characteristics. The primary, the fixed part, or stator, consists of a hollow cylindrical core of soft steel ring stampings carrying the electrical winding in slots on its inner surface. The windings are built up of coils, machine-wound and thoroughly insulated before being placed in the slots. In the larger sizes of low pressure machines, copper strap or bars take the place of the wire coils. The core and winding of the primary are rigidly secured in a cast-iron enclosing cylinder, which forms the frame of the motor. The enclosing end plates or brackets of this cylinder carry the two shaft bearings of the rotating secondary. The core of the secondary is built up of soft steel laminations on an open spider. Rectangular copper bars are laid in slots in the core periphery and are bolted at each end to massive copper rings. No current is led to the rotating part. There are no commutators, collecting rings or rubbing electrical contacts of any description. The only frictional surfaces in the machine are at the shaft bearings. The secondary conductor being short-circuited purposely in the end rings, cannot develop any electrical fault, and the whole construction of the rotating part is one which gives simplicity, rigidity and durability. It is thus perfectly adapted for work in dusty and exposed situations and requires the minimum of attention.

Of the motors installed at Messrs. Palmer's works the smaller sizes up to 10 H.P. are started by coupling direct to the 400-volt mains; the larger are started through an auto-starter, which consists of a double-throw switch working in conjunction with a pair of small transformers. With the switch on in one position the two transformers are placed between main supply and the motor circuit, the motor receiving current at a reduced pressure. The transformers are arranged with a series of loop wires from the winding so that the value of the starting pressure may be adjusted to give the most suitable starting torque. Throwing the switches over in the other direction after starting places the motor direct on the supply circuit. The auto-starter consists of a cast iron box containing the transformers, on the lid of which the two-way switch is fixed. These starting switches may be placed at any distance from the motor, an advantage when motors are necessarily installed in places difficult of access. The various motors distributed about the shops have, as a rule, their starting switches or auto-starters placed close alongside. The starting switches of the tools in the yard are generally placed in a small iron box fixed against the standard of the machine tool.

Economies resulting from the change in driving power have proved to be considerable. Compared with steam power as before used, the principal saving in the cost of energy is due to:

1. The centralization of the power plant, whereby the plant operates economically in large units at about full load. Transport cost of fuel and refuse and also attendance and maintenance costs are reduced to a minimum.

2. The efficiency of this transmission of electric power along wires. ...engths of wire, although coupled to the live supply circuit, do not ...rgy as would be the case through condensation in a length of ...nder similar conditions.

...rent passing into an electric motor is practically in direct ... load on the motor.

... so easily started and stopped by the simple closing or ...h that there is no excuse for leaving one running ...t space of time.

...ance and very little attention is required by the ... distributing apparatus.

...mical advantages with the similar conditions of ...n practice requiring:

...oiler installations, each with its small army of ...uiring fuel delivered, which fuel is wastefully consumed in comparatively small steam-generating units, operating for the most part under very light and intermittent loads.

2. The loss of power due to condensation and the various long lengths of steam piping required between the various engines and the steam power house.

3. The steam consumed by the various small engines is not by any means proportional to the work being done by them, the steam consumed at all loads approaching near to the constant maximum.

4. Steam engines, especially the type used for workshop driving and fed by long lengths of steam mains, are not quickly and easily started, consequently they are usually run continuously during working hours, whether the machines driven are in use or not.

5. Constant and, to a certain extent, expert attendance is required by the steam engines, and the running expenses of materials, attendance and repairs are, as a rule, very heavy.

It will be seen, therefore, that for such work as the independent driving of the many machines—punchers, shears, hoists, pumps, etc.—in the yard, electrical power introduces advantages and economy; also that in the shops considerable saving is sure to result from the substitution of an electric motor for each steam engine previously used for driving shafting and the several machines connected thereto. It must not be overlooked that the motors labor under the disadvantage of having the long lengths of power consuming shafting and belts between them and the machines to be driven, and it is here that further improvements will undoubtedly be made in the near future. The principle, as adopted in the yard, of "one motor, one machine" could with care be applied to give excellent results in many instances in the workshops.

NATIONAL RECIPROCITY CONVENTION RESOLUTIONS.

In the resolutions adopted by the national reciprocity convention at Washington there is a complete repudiation of the work done by Reciprocity Commissioner John A. Kasson, and even a plainer note of warning to the senate not longer to consider the Kasson treaties, now pending. The resolutions follow:

"Whereas, the growth of manufactures in the United States, represented in values and in round numbers, has been as follows: 1850, $1,000,000,000; 1860, $2,000,000,000; 1870, $4,000,000,000; 1880, $5,500,000,000; 1890, $9,000,000,000; 1900, $15,000,000,000. And whereas, these figures exhibit at the same time (1) a splendid result for the past industrial policies of our government, and (2) a growing need for the development of larger markets in foreign countries. And whereas, it would seem desirable not only to maintain policies under which such splendid results have been accomplished, but also devise means to develop increased markets for the increased and increasing manufactured products, therefore, be it resolved:

"First—That this convention recommends to congress the maintenance of the principle of protection for the home market, and to open up by reciprocity opportunities for increased foreign trade by special modifications of the tariff, in special cases, only where it can be done without injury to any of our home interests of manufacturing, commerce or farming.

"Second—That in order to ascertain the influence of any proposed treaty on our home interests, this convention recommends to congress the establishment of a reciprocity commission which shall be charged with the duty of investigating the condition of any industry and reporting the same to the executive and to congress, for guidance in negotiating reciprocal trade agreements.

"Whereas, the present and increasing magnitude of the aggregate manufacturing and commercial interests of the United States has become far too great to be adequately handled by any of the existing government departments; and whereas, changing phases of these great interests are constantly bringing new and important questions, the proper determination of which would require all the work of a department fully organized and equipped, therefore, be it resolved:

"First—This convention recommends to and requests of congress that a new department be created to be called 'the department of commerce and industries,' the head of which shall be a member of the president's cabinet.

"Second—That a reciprocity commission be created as a bureau of this new department."

MORE CONTRACTS FOR LAKE SHIPS.

It is not expected that the last of thirty large steel vessels, now building or under order in the different yards of the American Ship Building Co. on the great lakes, will be completed before July 15 next, and yet the company books a new order almost every week. Negotiations now under way will probably result in orders being placed by Cleveland parties within the next few days for two large freight steamers. The Detroit works of the American company is reported to have closed a contract with the Detroit, Belle Isle & Windsor Ferry Co. for an excursion steamer, which they propose in some way to finish about June next. Dimensions of the vessel have not been given out as yet but as she will be for river service between Detroit and the summer resort on Bois Blanc island, a run of twelve or fifteen miles, she will probablv not be a very costly craft, although planned to carry a large number of passengers.

The Craig Ship Building Co. of Toledo, O., closed a contract a few days ago with the Adams Transportation Co. of Detroit (Thomas Adams and others), for a steel freight steamer of 350 ft. length and about 5,000 tons capacity.

Important speed trials of the armored vessels of the North Atlantic squadron are to be made on the Barren island trial course in Chesapeake bay. The object of these trials is to determine to what extent these ships have deteriorated in speed since they were placed in commission. Runs will be made under forced draft and conditions as nearly as possible approaching those obtaining in battle. The idea of having these trials originated with Rear Admiral George W. Melville, chief of the bureau of steam engineering. It has not been customary to run warships at forced draft, at which their highest speed is developed. The evidence at the Schley inquiry developed that, even with forced draft, comparatively low speed was made by the United States warships in the battle of Santiago. This poor showing was never fully understood and the Barren island experiments are to determine the causes of deterioration in speed, if possible, so that remedial means may be employed.

PROMOTION IN THE NAVY.

BY LAWRENCE IRWELL.

The navy is, and usually has been, the special pet of both the government and congress. There is now little foundation for the belief—a belief which was at the root of the Spanish contempt of the American navy at the beginning of the war with Spain—that American crews are a decidedly mixed lot as to nationality; that sailors on American ships are chiefly Norwegians, Germans and Italians, with a sprinkling of Japanese, and that native-born Americans are hard to find. The truth is, however, that the majority of the men of the American navy are citizens. Even as far back as 1894, of the enlisted force of the navy, 50 per cent. were native-born sons of Uncle Sam, 70 per cent. were American citizens, and more than 90 per cent. were residents of the United States. Of the 30 per cent. of aliens, more than one-third had declared their intention of becoming citizens. And not only does the navy stand much better in this important respect today, but there never was a time when places in it below the rank of commissioned officers were so attractive to Americans. Several reasons might be given for this. One is that the money wages of a large number of sailors in certain grades have been greatly increased in recent years, thus bringing the navy pay-list into favorable comparison with that of outside labor. But the chief reason for the great change that has taken place in the conditions of the navy of late lies in the fact that, as the old wooden ships and the old-fashioned steam-propelled ships have given place to modern marine machines, the navy has become more and more suited to the taste of capable Americans.

The gradual change in the navy has brought about a marked change in the personnel of the petty officers and the enlisted men, as well as in the conditions under which they work. It may almost be said of the American as of other navies that there are no longer any sailors in the service. The only sailing ships that ever move from place to place now are the school ships and training ships. The navy, it is true, still ships boys and seamen at wages ranging from $9 to $24 a month, to whom bounties of three months' pay are given upon re-enlistment, and it is not an uncommon thing to see an enlisted man paid off at the expiration of his three years' term of service with several hundred dollars to his credit. The regular blue-jackets of the navy are a decidedly well-paid class, and are much better off than their brethren of the merchant marine.

Besides seamen proper, the navy also ships a host of machinists, mechanics, boilermakers and firemen at wages sometimes exceeding $70 per month, in addition to board, afloat or ashore. The new navy, as it grows, will need an ever-increasing number of men in these special classes—the classes which contain the pith of American ingenuity and skilled labor. There are now many new ships building, and every new iron or steel steam-propelled monster that is added to the navy creates an increased demand for the skilled and highly-paid classes of enlisted men. Already there are many hundreds of machinists at $70 per month, boilermakers at $60, blacksmiths at $50, plumbers at $45, water tenders, oilers, firemen and painters at between $30 and $40 per month, to say nothing of coppersmiths, shipwrights and coal passers at wages varying between $22 and $50 per month. Even the seamen class, the worst paid of all in its lower branches, is very well paid in the higher ranks. The boy who enters as a third-class apprentice at $9 per month may reasonably hope to become chief master-at-arms at $65 per month; or, better still, he may reach the coveted rank of warrant officer, with pay and privileges the same as those of the lieutenancy grades, namely, from $1,200 to $1,900 per annum, exclusive of board.

Let us glance for a moment at the interesting class of naval apprentices—the carefully trained boys upon whom Uncle Sam founds his hopes of ultimately manning his ships—boys who are conspicuous by reason of their intelligence and patriotism. If a boy decides to enter the navy, there are two ways of going about it. He can enter either as an officer or as an ordinary sailor; but in the latter case he must remember that although he may rise to the honorable and well-paid rank of warrant officer, he can never hope to tread the quarter-deck as a commissioned officer. It may be interesting, first, by way of comparison to take a few facts and figures from the British navy, the only other navy suitable for comparison on the score of pay and promotion. Boys are taken into the British navy between the ages of fifteen and sixteen and a half years, and by diligence and good conduct they can rise, as in the American service, to the rank of warrant officer. They make an engagement to serve for ten years on attaining the age of eighteen, and after that age they are rated as ordinary seamen and able seamen as soon as they are qualified. When a boy enters the service he receives gratuities of £5 ($25) for outfit and £1 for bedding, and on being rated a first-class boy he receives a further sum of £2 10s. ($12.50) for clothing purposes. The scale of pay, in addition to a liberal supply of provisions, is as follows: Boys receive from £9 ($45) to £10 12s. ($53) a year; ordinary seamen from £18 to £23 ($90 to $115); able seamen from $145 to $160, petty officers from $175 to $290, and warrant officers from $500 to $820 a year. Men are allowed pensions after twenty years' service, or when disabled, of from $90 to $260 per annum; and those who remain in the service after twenty years can obtain larger pensions. Warrant officers receive pensions rising to $750 a year, and pensions are given to their widows. To sum up, then, any ordinary boy who joins the English navy has it within the possibilities of his career to become some day a warrant officer, and to retire with a pension of $750 when he is not necessarily more than forty years of age.

Let us look now at Uncle Sam's side of the account. Boys of good character who have no physical defect, and who can read and write well, are admitted into the American navy between the ages of fourteen and eighteen years. They must serve till the age of twenty-one as boys or junior seamen, and after that age they rank as seamen or petty officers. They are allowed a sum of $45 for outfit. To ascertain the exact number of petty officers on board a ship is by no means easy; but in any case the number of these minor prizes is encouragingly large, while still higher up, as the final goal of the sailor's aspirations, are the four warrant officerships, the positions held by the boatswain, the carpenter, the gunner, and the sailmaker, whose pay and privileges, as given above, are the same as those of the junior officers. The pay of boys enlisted as third-class apprentices is $9 per month; the next promotion to second-class brings $10; the next, to first-class apprentices, $11 a month. Further up the scale we find second-class seamen apprentices with $19, followed by first-class seamen apprentices with $24 per month. (The latter two grades correspond respectively to ordinary seamen and able seamen—or simply seamen.) From a comparison of these figures we can see that a first-class seaman apprentice, or a seaman, receives $288 a year, a sum which is $128 in excess of the highest amount paid to a first-class seaman in the British service. Even a third-class apprentice in the American service receives more pay than an English naval cadet; a second-class seaman apprentice receives more than an English midshipman, and an American lieutenant or boatswain receives in pay a sum far in excess of an English lieutenant's pay, even with all the occasional extra money allowances thrown in. An English lieutenant's highest pay is about £185 ($925) a year; the pay of an American lieutenant or warrant officer ranges from $1,200 to $1,900 a year. This, then, is the income to which a poor boy may reasonably look forward to attaining in the United States naval service; and at the age of sixty-two years he can retire with a pension of three-quarters of his current pay, just the same as a commissioned officer. That is, he can carry with him on his retirement a perpetual order on the treasury for a sum of from $800 to $1,425 a year, the lower figure of which considerably exceeds the $750 which is the utmost limit of the British warrant officer's pension. The latter, however, has one great advantage, and one which tends to the good of the British service by hastening promotion, namely, that he can carry away his pension of $750 when he is not more than forty years of age. Even if the American seaman does not attain to warrant rank, there is still the middle grade of the petty officer, whose name is legion in Uncle Sam's navy, and who receives from $27 to $70 a month, and can retire with a pension after thirty years' service. A boy with a gift for music can easily get himself transferred to the special class that includes musicians and pharmacists, and here the wages vary between $18 and $60 per month.

There is a special provision of law to encourage good men to remain long in the service. The ordinary term of enlistment is three years, and by this provision any honorably-discharged man who re-enlists within three months from the date of his discharge returns to the navy with $1 per month additional good-conduct pay. The extra dollar is added to each enlistment, and there may easily be half a dozen re-enlistments, or possibly, a dozen. It means that a good man who sticks to the service for life gets a three months' vacation with full pay every three years, followed by an increase of pay. It usually happens that the man who thus enlists and re-enlists has reached the grade of petty officer at his third or fourth enlistment, and after that the larger pay of his new rank increases regularly a dollar per month every three years, should he choose to remain in the service. And if physically disabled, a man, after ten years' service, is entitled to a pension of $8 a month, and after twenty years' service to half his pay. In addition to these privileges, frequent short furloughs of from three to six days are granted to enable boys and men to visit distant relatives, and always on full pay. A boy has almost unlimited daily liberty, and while in port, if his home is near, he is allowed to stay there from Saturday to Monday if his conduct on board ship is satisfactory.

Turning again to the skilled workers in the navy today, the mass of them receive, in the long run, better pay than the avarage wage-earners on shore, without counting the added advantages of subsistence, credit for service, pension, etc. It is true that mechanics in the navy receive nominally smaller wages than men of their trades ashore, but they are subject to none of the uncertainties of business or weather, or the stoppages caused by sickness. The navy "goes right on" in times of depression of trade, and there is no docking for sickness. Employment and pay are secure for the rest of a man's days, and promotion is almost within his own control. Nearly every walk in life has ex-members of the navy in its ranks, for it has been found by hundreds that a cruise will do much to educate and develop a bright young fellow who wants to get a few hundred dollars ahead with a little experience of the world thrown in.

The aristocratic organization of the navy has doubtless hitherto kept many self-respecting men from enlisting, but the service is vastly more democratic in practice than in theory. In this respect it offers a refreshing contrast to the army. Anything more pleasing than the harmonious blending of the strictest discipline with the maximum of companionship, so characteristic of the relations between officers and men on board a well-regulated American war ship, is not to be found in any other department of life. True, no enlisted man can hope to become a commissioned officer, but the enlisted man of tried ability and known good conduct always earns the respect and consideration of his superiors. The brutal officer is almost unknown in Uncle Sam's navy, and the self-respecting enlisted man is rarely made to feel that anyone looks down upon him. Moreover, the seaman whose conduct does not curtail his "liberty," may see foreign lands as an enlisted man in a satisfactory and instructive fashion. There are hundreds of enlisted men in the navy who are thoroughly trusted ashore. A man's reputation for good conduct when away from his ship is a matter of careful record. Any young man who makes up his mind to endure with patience a life of discipline and regularity invariably finds the navy agreeable, interesting and profitable.

Perhaps the above facts, founded on a careful study of the subject, may serve to explain the reasons for the popularity and efficiency of the United States navy.

ECONOMY OF LARGE SCHOONERS.

"As bearing on the money making abilities of the large schooners now generally used in the coasting trade," says the Commercial Bulletin of Boston, "some figures which have been compiled by Mr. Frank N. Tandy, general marine agent of this city, will be of interest. Mr. Tandy has taken the statements of four large schooners, two four-masters and two five-masters, which have been used in the Atlantic coast trade, and in a very full table clearly shows what vessels of this type are capable of earning, even when freight rates are as low as they are at present. Vessel No. 1 made twelve voyages, consuming 512 days to date. It paid dividends of $16 to $84 per trip on each sixty-fourth share, the total for the twelve trips figuring up $442 per 1-64 or 38.8 per cent. of the cost of the ship in that time. This vessel cost $72,960; her gross tonnage is 1,904 and her carrying capacity 3,000 tons. The three other vessels from whose statements data are compiled paid from $12 to $100 per 1-64 each trip, and the average for the fleet shows a dividend of $33 per 1-64 each trip and a yearly profit of 27.5 per cent. on the investment. The net earnings have so far averaged 42.9 per cent. of the gross receipts and 18.9 per cent. of the total cost of the vessels has so far been paid.

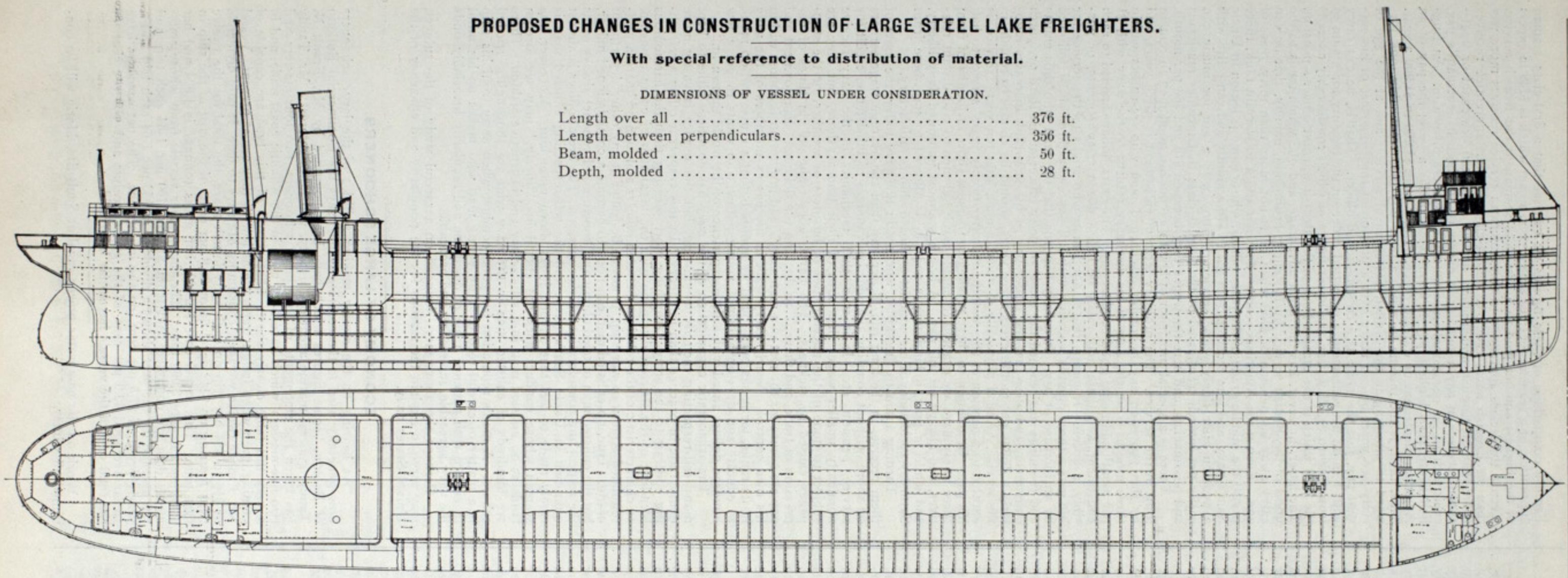
Work on the new water power canal at Sault Ste. Marie will be continued all winter.

PROPOSED CHANGES IN CONSTRUCTION OF LARGE STEEL LAKE FREIGHTERS.

With special reference to distribution of material.

DIMENSIONS OF VESSEL UNDER CONSIDERATION.

Length over all	376 ft.
Length between perpendiculars	356 ft.
Beam, molded	50 ft.
Depth, molded	28 ft.



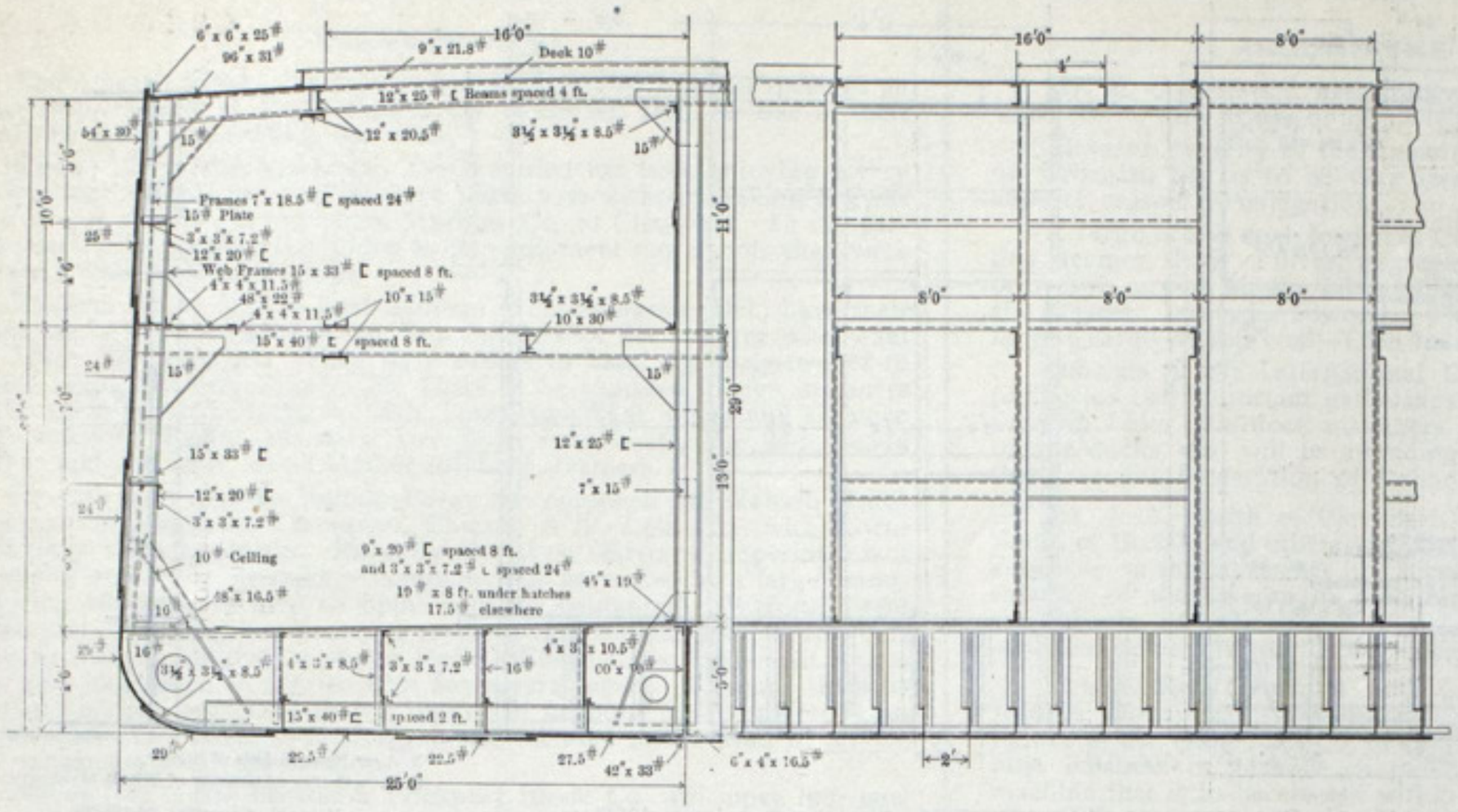
In the drawings appearing on this and the two following pages, Capt. F. D. Herriman of Cleveland, surveyor-general of the Great Lakes Register (ship classification society) presents the views of the publishers of the register regarding changes that should be made in the distribution of material entering into the modern type of lake freighter. It will be remembered that some four years ago the Globe Iron Works Co. of Cleveland (now a part of the American Ship Building Co.) brought out a design of bulk freight steamer that differed radically from previous practice in the matter of distribution of material, due to what is known as 4-ft. frame spacing instead of the 2-ft. system of frames generally acknowledged as the proper distribution of frame material by all classification societies. Details of the so-called Globe Iron Works design will be found in the drawings. Many ships have been built in accordance with this design, but Capt. Herriman says he has met with numerous difficulties on account of it and has to make extended explanations when dealing with representatives of the Bureau Veritas and other well-known classification societies that have to do with the interests of insurance companies as well as the ship owners. This is why he proposes the 3-ft. plan of frame spacing, also fully illustrated, and he claims for it some new advantages, in addition to equality when compared with the 4-ft. system on the score of cost of construction, weight of material, etc. Of course it was claimed for the so-called Globe Iron Works or 4-ft design that it had decided advantages as regards less riveting, weight of material, etc., the ship carrying more cargo but retaining sufficient strength to safely do its work.

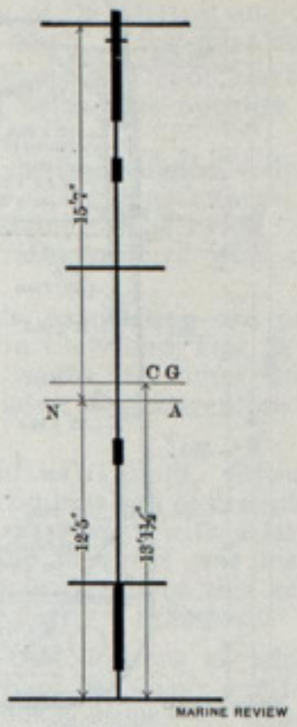
Referring to the general plan and the several sectional drawings, Capt. Herriman says:

"According to all established building rules, the maximum area of unsupported shell plating cannot exceed 16 superficial feet, but less care is being given to the spacing of the hold stringers and ships have been built and are now being built with 24 and even 32 superficial square feet of shell plating unsupported by either frame or stringer. This large area of unsupported plating, perhaps of ½ in. or less in thickness, presents an element of danger, to say nothing of the battered appearance these plates must present as the vessel grows old. In the present 4-ft. system, too, every alternate floor is a disconnected member. It has no body frame to support it. It is an incumbrance and an extra weight that has been transferred and turned to good account in the proposed new construction. In the present system, with deck beams necessarily spaced 4 ft. apart, we have stringers and deck plating deflected and buckled for want of further support. In the proposed new method of construction, with all body frames, floors and beams, spaced 3 ft. apart, we have what should be considered a happy medium between the 2 and 4-ft. spacing. Every floor is supported by a frame with its beams and connecting brackets forming a continuous and strong member that circles the body of the vessel, and by careful spacing of longitudinals and side stringers the area of unsupported shell plating does not in any case exceed the established rules.

"By this 3-ft. spacing of frames, with an upper deck beam on every frame, we have a most excellent support for our upper deck stringers and light deck plating. We are also enabled to increase the fore-and-aft openings of our hatchways, and as one prominent ship builder and ship owner remarked, on examining the drawings, this in itself is worthy of adoption of the proposed new construction.

"It will be noted by the drawings, in which comparison of methods is made, that the weight and strength of section No. 2 and its 4-ft spacing of frames are contrasted with No. 1, the old type of 2-ft. spacing of frames and web frames every 8 ft. apart. Sections 3 and 4, the new methods, are compared with section 2, and you will note that the equivalent girder of section 4 shows a more uniform and stronger girder with less weight of material and more central neutral axis than the other sections. Our object in producing No. 4 section, whose distribution of material is the same as No. 3, is to show a more convenient type for handling bulk cargo. By raising the lower or hold beams, there is no clogging or hindrance to the free use of the bucket or clam shell in discharging ore or coal, as is the case with No. 3. A marked saving of time will be made by carrying the hold beams as shown in section 4. The type of vessel we are presenting is intended to carry 5,500 gross tons of cargo on a mean draught of 18 ft."

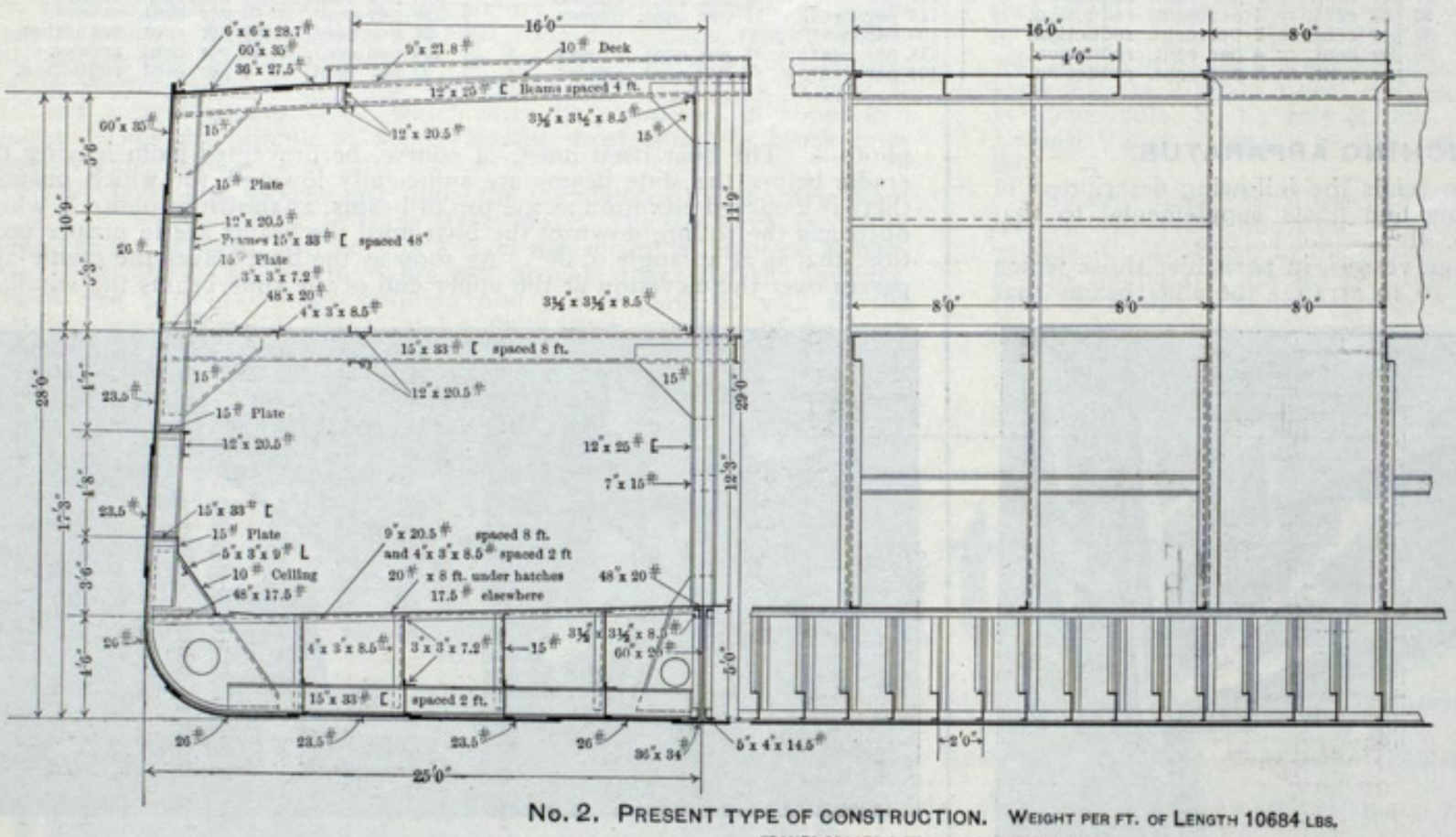


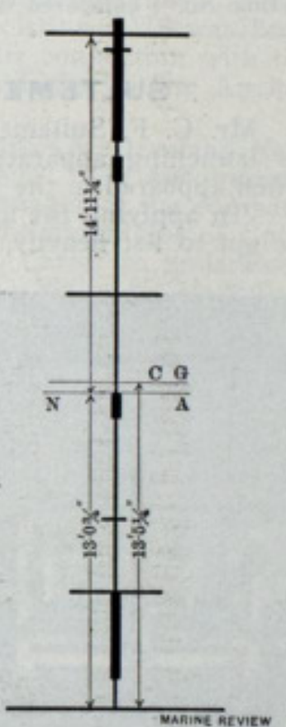


N. A. — Neutral Axis of Girder.
C. G. — Center of Gravity of Whole Structure.

Moment of Inertia 24,136,436
Modulus of Section 129,071

No. 1. OLD TYPE OF CONSTRUCTION. WEIGHT PER FT. OF LENGTH 10960 LBS.
FRAMES AND FLOORS SPACED 24 INCHES.

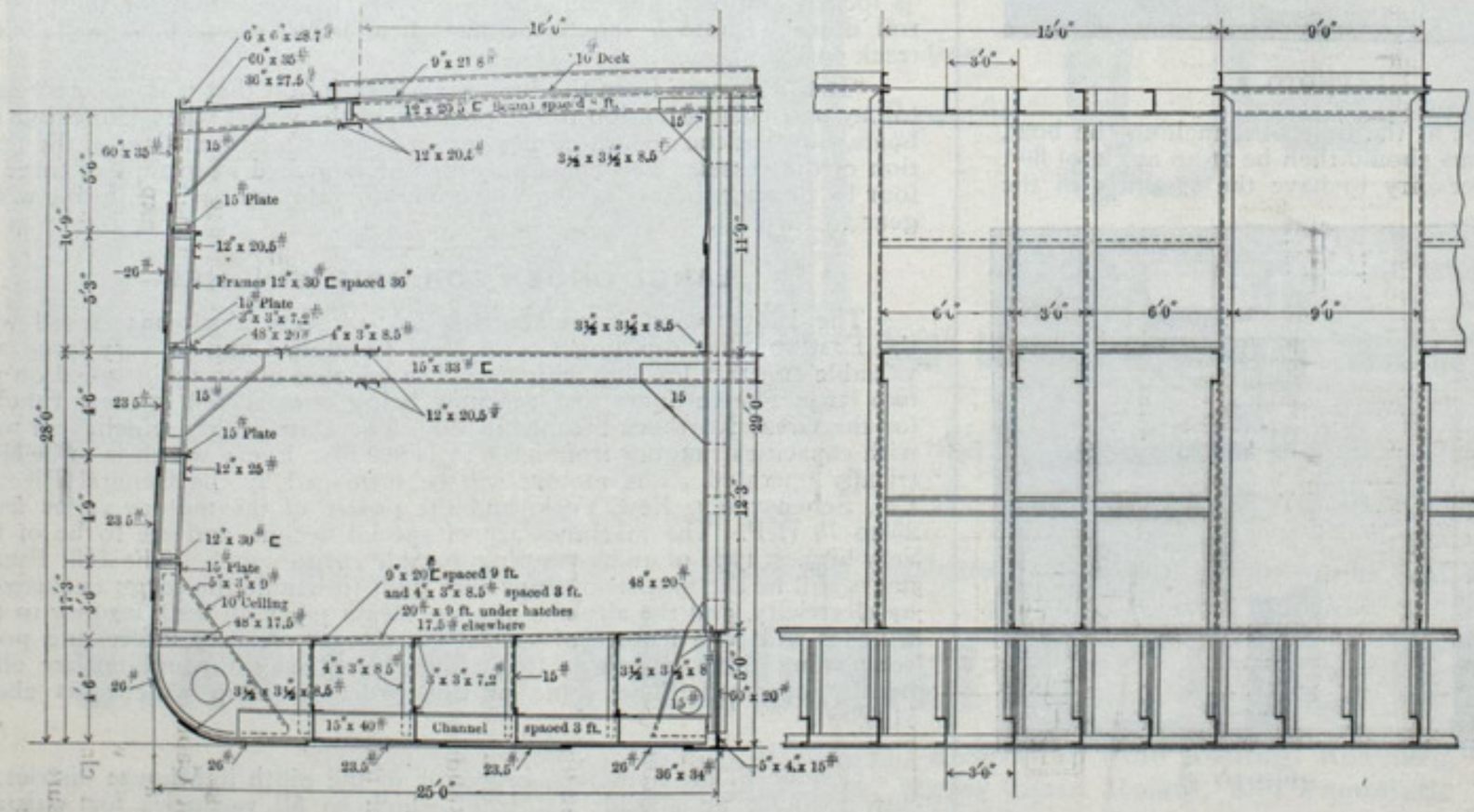


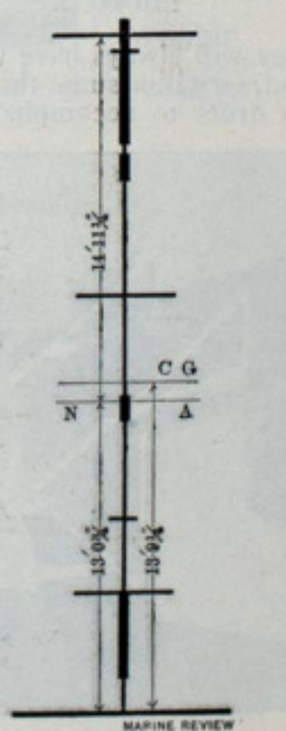


N. A. — Neutral Axis of Girder.
C. G. — Center of Gravity of Whole Structure.

Moment of Inertia 26,135,034
Modulus of Section 145,802

No. 2. PRESENT TYPE OF CONSTRUCTION. WEIGHT PER FT. OF LENGTH 10684 LBS.
FRAMES SPACED 4 FT., FLOORS SPACED 2 FT.



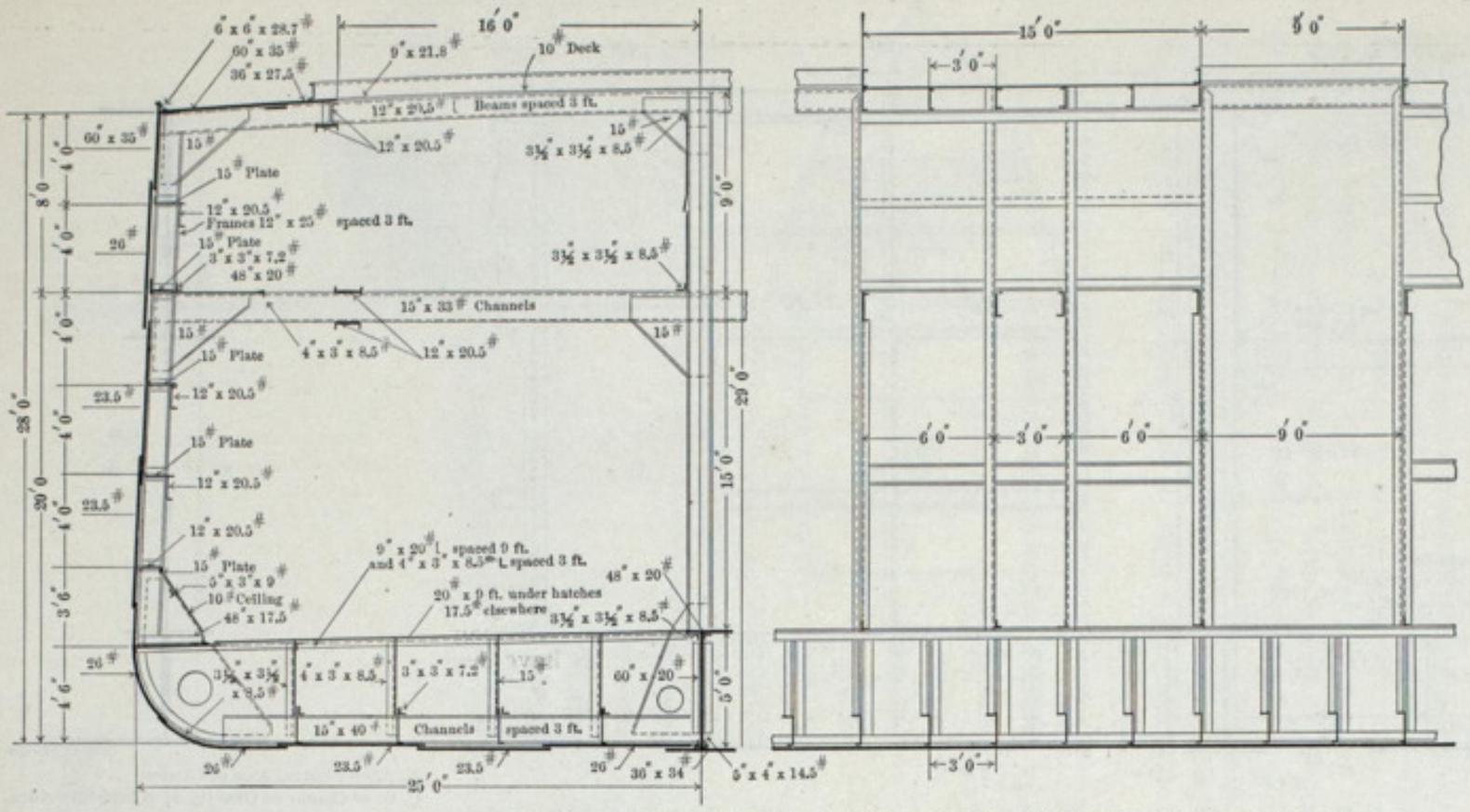


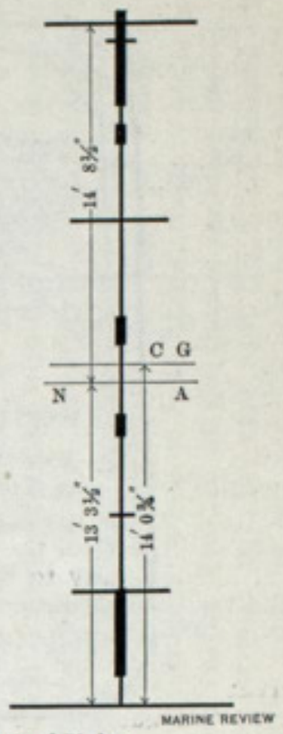
N. A. — Neutral Axis of Girder.
C. G. — Center of Gravity of Whole Structure

Moment of Inertia 26,135,034
Modulus of Section 145,802

No. 3. PROPOSED TYPE OF CONSTRUCTION. WEIGHT PER FT. OF LENGTH 10544 LBS.
FRAMES AND FLOORS SPACED 3 FEET.

SEE NEXT PAGE FOR ADDITIONAL PLANS AND COMPARATIVE DATA.





N. A.—Neutral Axis of Girder.
C. G.—Center of Gravity of Whole Structure.

Moment of Inertia 26,876,280
Modulus of Section 152,273

No. 4. PROPOSED TYPE OF CONSTRUCTION. WEIGHT PER FT. OF LENGTH 10545 LBS.
FRAMES AND FLOORS SPACED 3 FEET, SIX SIDE STRINGERS.

Comparison.	Weight of hull.	Modulus of section.	Strength of framing for transverse stress.
Section No. 2 compared with No. 1.	97 per cent. = 3 per cent. reduction.	113 per cent. = 13 per cent. excess.	151 per cent. = 51 per cent. excess.
Section No. 3 compared with No. 1.	96 per cent. = 4 per cent. reduction.	112 per cent. = 12 per cent. excess.	130 per cent. = 30 per cent. excess.
Section No. 3 compared with No. 2.	98 per cent. = 2 per cent. reduction.	100 per cent. =	86 per cent. = 14 per cent. reduction.
Section No. 4 compared with No. 1.	96 per cent. = 4 per cent. reduction.	118 per cent. = 18 per cent. excess.	140 per cent. = 40 per cent. excess.
Section No. 4 compared with No. 2.	98 per cent. = 2 per cent. reduction.	104 per cent. = 4 per cent. excess.	92 per cent. = 8 per cent. reduction.

SULTEMEYER'S LAUNCHING APPARATUS.

Mr. C. F. Sultemeyer of Chicago sends the following description of his launching apparatus for life boats and floats supplemental to that which appeared in the Review of Oct. 31:

"In applying the apparatus to large vessels, in particular those which are apt to list heavily, it is desirable to so arrange the slide beams that they will always have the proper slope at the time of launching the boat, and we will assume that the slide beams should then be at an angle of 30°. In order to accomplish this it is necessary to have the supports of the beams movable, so that they can be raised or lowered as required. The supports are held by two wire ropes attached to a windlass, operated by a worm gear, as shown in photos 1, 2 and 3. The position of the slide beams can therefore be controlled by turning the wheel in the rear of the cradle,

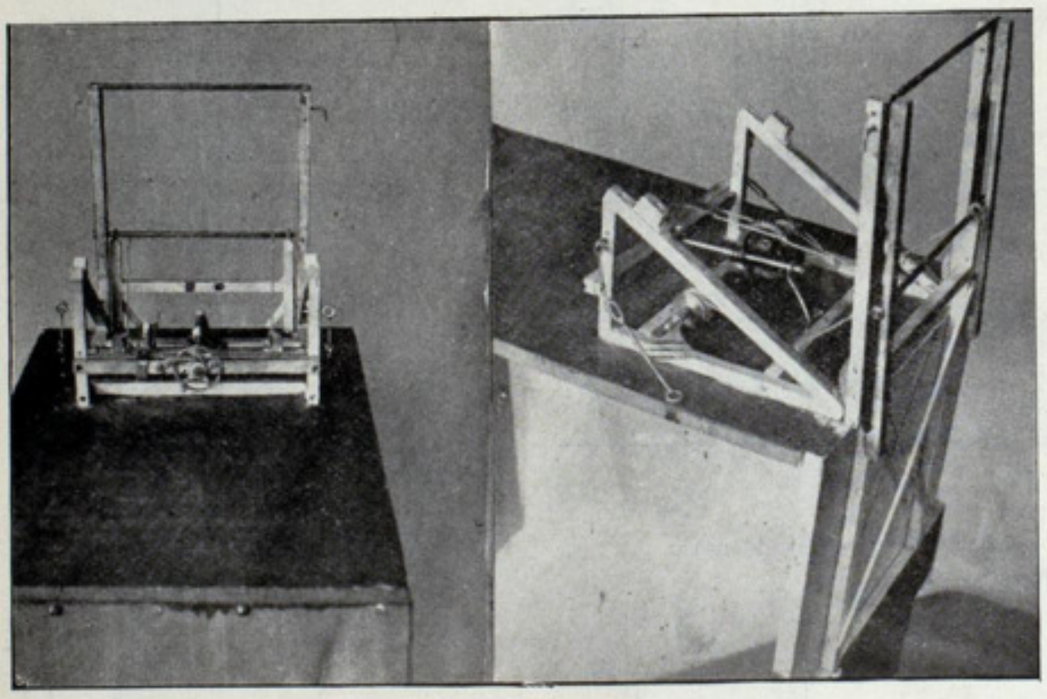


PHOTO. 1. PHOTO. 2.

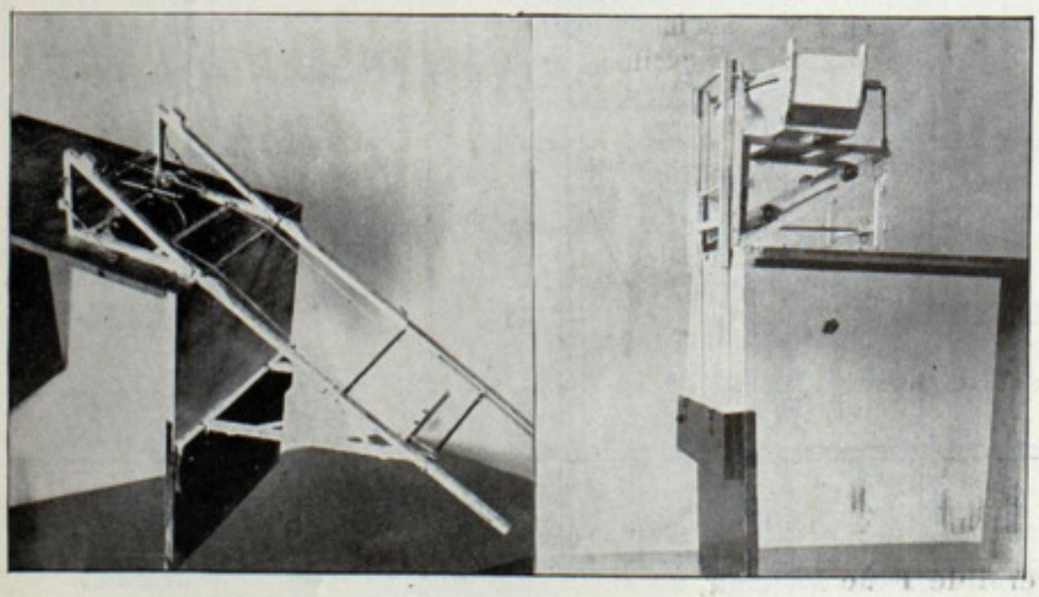


PHOTO. 3. PHOTO. 4.

photo 1. The boat itself must, of course, be prevented from leaving the cradle before the slide beams are sufficiently lowered, for which purpose there is a curved elevation at the top of beams, as shown in photo 3, which obstructs the rolling down of the boat until the beams are in proper position, that is at an angle of 30°. As soon as the boat leaves the cradle and passes over the elevation at the upper end of the slide beams the windlass

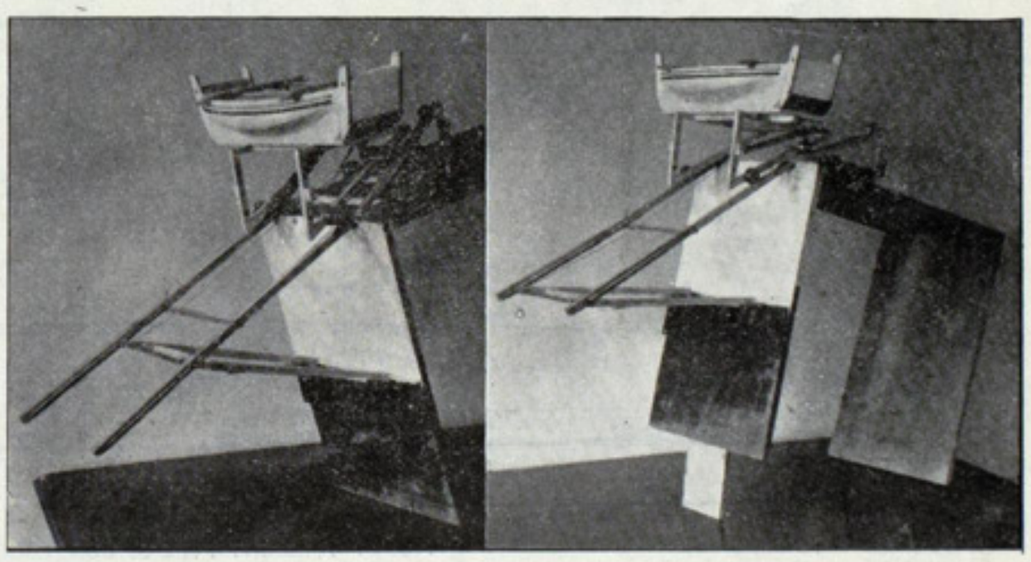


PHOTO. 5. PHOTO. 6.

is locked automatically and the beams are held securely for the boat to roll down. Photo 5 shows the boat held back; photo 6 shows a clear track for the same.

"It will be seen from the foregoing description that it is not necessary to pay particular attention to the position of the vessel when launching the boats, but that the operation may go on at any time regardless of the position of the vessel. The boats may also be launched in groups of three or four by placing the pulleys on one common axle and by having one worm gear to turn all."

LARGE ORDER FOR SHIP WINCHES.

The Lidgerwood Manufacturing Co. of New York has closed with the Eastern Ship Building Co. of New London, Conn., a very large and valuable contract for ship winches. The winches are to be installed on the two large Pacific liners that are now being constructed at New London for the Great Northern Steamship Co. There are eighty winches all told, with capacities ranging from 3,000 to 14,000 lbs. Every winch is to be electrically operated. The motors will be furnished by the General Electric Co., Schenectady, New York, and the power of the motors varies from 25 to 75 H.P. The machines are of special design, and are to be of the very highest type of quick-running durable cargo winch. The Hill Pacific liners will be the first steamships ever built to handle the cargo exclusively by electricity, and the absence of large steam pipes on deck leading to the winches will be a feature of special advantage. A very interesting point concerning these vessels is that all the auxiliaries throughout are electrically operated. The value of this order for ship winches is about $100,000.

Com'dr F. M. Symonds, inspector of the ninth lighthouse district, is now forming an eligible list from which to fill vacancies for assistant engineers of vessels in the lighthouse service which may occur in his district for one year. Persons wishing to take the examination can apply for blanks, either in person or by mail, to his office, room 1431 Marquette building, Chicago.

TRADE NOTES.

The Atlantic Works Incorporated of Philadelphia has just received an order from Messrs. G. K. Phillips & Co. of Bethel, Del., for one of their band saw setting and filing machines.

One of the marine machinery concerns that has been enjoying a very prosperous business for two or three years past without making a great deal of fuss about it, is the Chase Machine Co. of Cleveland. In the past two years this company has added to its equipment more tools than were formerly contained in its shops.

Thomas Drein & Son, boat builders of Wilmington, Del., have their shops again filled with work for ship builders of the country who want life boats, life rafts, etc. They have orders in hand for forty-two 22-ft. patent beaded galvanized steel life boats to be supplied to new steamers of the great lakes; twenty-two 28-ft. boats, two 24-ft. boats and eighteen large rafts for Pacific steamers; two 24-ft. steel boats, one 24-ft. wood clinker and one 18-ft. wood clinker for Gulf steamers.

Several years ago the Buffalo Forge Co. equipped the Wabash (Ind.) shops of the Cleveland, Cincinnati, Chicago & St. Louis Ry. with down-draft forge shop apparatus. Recently Mr. Wm. Garstang, superintendent of motive power for the railway company, was requested by a large manufacturing company to give an opinion of the equipment. Writing direct to the manufacturing concern (not to the forge company) he said: "Our Wabash shop is equipped with the Buffalo Forge Co.'s down-draft forges and they have been in service now for several years. I regard them as a great success, especially in the matter of keeping the shop free from smoke and gas. There is no forge better adapted to the kind of service that requires a clear, clean shop.

About Dec. 1 the Boston & Lockport Block Co. will move into new quarters at 158-160 Commercial street, Boston, where they are having fitted up, to accommodate a large increase in business, an entire block of five floors and basement. They intend to carry a much larger stock than ever before, especially in wire rope blocks and warehouse trucks of the kind made at their Lockport (N. Y.) factory. The first floor is to be devoted to offices. The second to a sample room for pumps, trucks, differential hoists, etc.; the third, a stock room for steel, iron and wood blocks; and the fourth floor, stock room for trucks. This company is now at work on a catalogue for 1902, which is to be completed in about two months. They are aiming to make this the most complete block catalogue ever published.

Work is rapidly progressing upon the foundations for the new plant of the B. F. Sturtevant Co. at Hyde Park, Mass. The buildings, including storage space between, will occupy a tract measuring in extreme dimensions about 500 ft. by 700 ft. This will provide space for the foundry, pattern and pattern storage building and power plant as well as the machine shop, 120 ft. by 500 ft., and a three-story structure of the same length, both terminating in a large head house, which will serve for the work of erecting, testing and shipping. The office will be a separate building of considerable dimensions.

AROUND THE GREAT LAKES.

Mr. H. C. Schnoor, well known to vessel men of the Detroit and St. Clair rivers, died at his home in New Baltimore, Mich., a few days ago.

Elevator capacity of the Canada-Atlantic company at Depot Harbor on Georgian bay is to be very largely increased before the opening of another season of navigation.

A cargo of soft coal, loaded in Cleveland a few days ago by the Wilson line steamer H. W. Oliver, aggregated 6,770 tons. The largest cargo of coal ever moved on the lakes—7,688 tons of anthracite—was carried by the steamer Isaac L. Elwood. The Elwood is also credited with the largest cargo of soft coal—7,388 tons.

Officials of the International Longshoremen's Association are preparing for two important gatherings. They meet in Cleveland, Dec. 2, to fix with Lake Erie dock managers a schedule of wages for winter work on the docks, and will be attending, a few days later, the convention of the American Federation of Labor in Scranton.

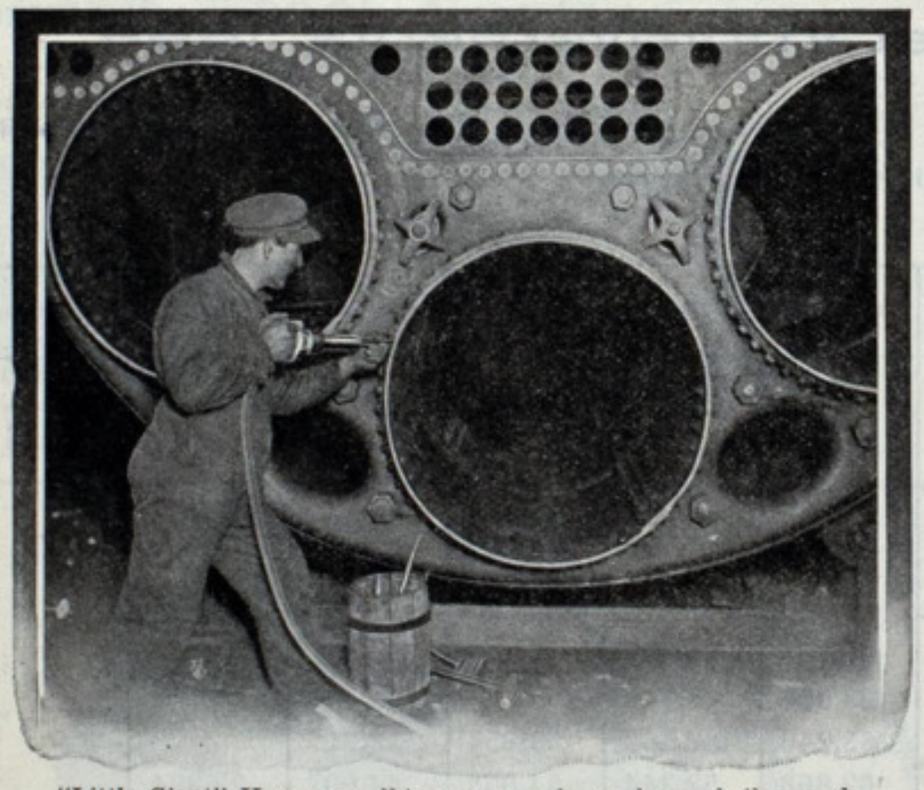
Mr. J. A. Smith of Cleveland, A. B. Wolvin of Duluth, Edward Smith of Buffalo and others who are promoting a combination of dredging concerns on the lakes met in Chicago during the past week with a large number of the owners of dredging plants. Some progress was made towards the consolidation. In their endeavor to bring about this consolidation Cleveland parties have been at work for nearly a year past.

The National Dock & Fuel Co., new lake coal concern of which John A. Donaldson is general manager, has purchased the docks and fuel lighter of the Ohio Fuel Co. in Cleveland and is thus equipped for steamboat business in advance of the construction of a modern car dump machine that is to be erected within the east breakwater enclosure. Offices of the company in the Perry-Payne building were opened several days ago.

Albert C. Lanctot, for a number of years connected with lake freight interests of the Lehigh Valley company at Buffalo, died at his home in that city Tuesday, aged forty-three years. Mr. Lanctot had many friends in transportation circles at Buffalo and was very highly regarded. He was a Mason of high standing, a member of the Buffalo Transportation Club and the Buffalo Local Freight Agents' Association. He was born at Churchville, N. Y., July 5, 1858. Previous to his connection with the Lehigh Valley company he was superintendent of docks for the Anchor line.

Senator James McMillan, who controls the Detroit & Cleveland Navigation Co., is thus quoted in a dispatch from Detroit: "The appointment of Wm. C. McMillan to the position of general manager of the company is only temporary. James H. McMillan, now in the mountains of Colorado for health, is to succeed Mr. Carter, and Mr. Carter so understood plans relative to the management of the company." Philip H. McMillan, another son of the senator, has been elected secretary and a director in the company, and James McGregor has been elected a director to fill the vacancy caused by the death of Mr. Carter.

"Little Giant" Pneumatic Hammers



"Little Giant" Hammer calking on very large, heavy boiler work.

Use 50% less air and do far more work than any other make of air hammer on the market. **Having no vibration or delicate parts,** they cause the operator no annoyance whatever.

Very Powerful.

Do not get out of repair easily.

Made in 8 different sizes.
Adapted for all classes of riveting, chipping, calking, beading, etc.

Sent on trial, and Express paid both ways, if not satisfactory.

"Little Giant" Hammers are used everywhere.
We make a specialty of installing complete air plants.

Write for Catalog "F." It gives full particulars regarding all the tools that we make.

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Manufacturers of Air Drills, Hammers, Reversible Flue Rolling, Reaming, Tapping and Wood Boring Machines, Motor Chain Hoists, and Pneumatic Tools and Appliances of Every Description.

General Offices and Works: AURORA, ILL. Eastern Offices: 141 Broadway, NEW YORK.

SHIP BUILDING IN PHILADELPHIA AND VICINITY.

Philadelphia, Nov. 27, 1901.—The new freight and passenger steamer Calvert, built by the Neafie & Levy company for the Weems Steamship Co. of Baltimore, was launched from the yard of that company last Saturday. Miss Matilda Williams, daughter of Henry Williams, president of the Weems line, was sponsor for the vessel. The Calvert is 190 ft. long, 40 ft. beam and 11 ft. 6 in. deep. Her power will be contained in a compound engine with cylinders of 20 and 40 in. diameter by 28 in stroke. There will be one boiler of the Scotch type, 14 ft. 9 in. in diameter by 12 ft. long, with steam pressure of 125 lbs. per square inch. When completed the Calvert will ply between Baltimore and Chesapeake bay points.

Preparations are nearly complete for the launch of the cruiser Denver at the Neafie & Levy yard. President Seddinger says it will not be more than two months before the vessel plunges into the Delaware. The torpedo boat destroyer Barry still remains on the ways. Her construction, however, is far advanced and when she goes overboard it will be with steam in her boilers and ready to proceed on her trial trip. The Bainbridge is at sea undergoing her acceptance trials. The builders of this trio of destroyers are awaiting with interest the result of the experiment made in altering the stem lines of the Bainbridge. Constructor Hanscom, who is on duty here, believes that her speed will be increased at least a knot by the water running off more readily and insists that an improvement has been gained over the original design.

Nearing completion in the ship yard of John H. Dialogue & Son, Camden, is a large ocean-going tug, which will be a valuable addition to the local fleet. She is building for A. S. Hughes' Sons for ocean towing and is of steel, 100 ft. long, 22 ft. beam and 12½ ft. deep. Her engines measure 15 and 30 by 22 in. When launched she will be christened John P. Hughes.

At Roach's Ship Yard, Chester, the steamship City of Memphis, building for the Savannah line, is now being plated. Her engine is practically complete and will be ready long before the hull is ready to receive it.

A syndicate of capitalists from Saginaw, Mich., is purchasing a fleet of barges to ply between Philadelphia and Port Arthur in the Texas oil carrying trade. The barge Chicago, formerly a New York ferry boat of the same name, has been sold by Peter Hagan of this port, to Arthur Hill of Saginaw, who represents the syndicate, for $10,500. The barges are to be towed up and down the coast by steam vessels. The syndicate contemplates purchasing sufficient vessels to land 1,000,000 gallons of oil at Philadelphia every month.

The Pintsch system of car and buoy lighting has received gold medals and the highest awards for excellence and efficiency at the world's expositions at Moscow, Vienna, St. Petersburg, London, Berlin, Paris and Chicago; also at Atlanta and at the Pan-American exposition at Buffalo. This system of lighting is controlled in the United States and Canada by the Safety Car Heating & Lighting Co., 160 Broadway, New York city.

SHIP YARD NOTES.

It has been decided to name the five-masted schooner which the Holmes Ship Building Co., Mystic, Conn., is building the Jennie R. Dubois. The vessel's dimensions are: Length over all, 275 ft.; keel, 230 ft.; breadth, 46 ft.; depth, 26 ft. The vessel has three full decks which extend her entire length. She will be equipped with all the latest appliances for handling cargo. The launch will occur about Christmas.

The new engineer's steamer Executive, which was recently launched from Story's yard, Essex, Mass., has been towed to Bertelson & Petersen's yard, East Boston, Mass., where her machinery will be installed. Her dimensions are 91 ft. over all, 24 ft. beam and 9½ ft. deep. She will be equipped with a triple-expansion engine.

McKay & Dix, Bucksport, Me., launched their first five-masted schooner this week. Her dimensions are: Length of keel, 250 ft.; beam, 43 ft.; depth, 21.9 ft. The firm will immediately begin the construction of a four-masted schooner to take the place of the Thallium.

Carleton, Norwood & Co., Rockland, Me., launched the four-masted schooner Annie last week. Although a four-master she is but 173.2 ft. long, 37 ft. beam and 13 ft. deep. She is a single decker of 613 gross and 512 net tons and is expected to carry about 1,000 tons.

It is reported that the Portland Ship Building Co., which at present operates a marine railway at South Portland, Me., purposes engaging in ship building on a more extended scale. It is now securing land adjoining its present plant.

The Pusey & Jones Co., Wilmington, Del., has contracted to build a stern-wheel steamer for Hammer, Slas & Co., Cindad, Bolivar, to be used on the Orinoco river and its tributaries.

Percy & Small, Bath, Me., launched the four-masted schooner Miles M. Merry last week. The vessel is of the following dimensions: Length, 215.2 ft.; beam, 43.2 ft.; depth, 20 ft.

Favorable progress is being made on the three-masted wooden schooner which Cobb, Butler & Co., Rockland, Me., are building.

H. M. Bean, Camden, Me., has contracted to build a five-masted schooner for Capt. J. G. Crowley of Taunton, Mass.

It is reported that George L. Welt, Waldoboro, Me., will shortly put down the keel for a six-masted wooden schooner.

The 1901 catalogue of Marine Iron Works, station A, Chicago, is sent free on their receiving request. It is descriptive of their product, so far as the special line of work in which they are engaged can be catalogued. 2

Chicago and return $10.50, via B. & O. R. R., Dec. 2, 3, 4. Call city ticket office, 241 Superior street. Nov. 28.

BELLEVILLE GENERATORS

Grand Prix 1889 — Hors Concours 1900
Originated 1849 — Latest Improvements 1896

Number of Nautical Miles made each year by Steamships of the Messageries Maritimes Co., Provided with Belleville Generators—Since their Adoption in the Service.

Year.	Australien	Polynésien	Armand Béhic	Ville de la Ciotat	Ernest Simons	Chili	Cordillère	Laos	Indus	Tonkin	Annam	Atlantique
1890	67,728	2,460										
1891	68,247	68,331	204									
1892	68,247	68,403	69,822	23,259								
1893	68,379	68,343	68,286	68,247								
1894	68,439	68,367	68,574	68,439	37,701							
1895	68,673	68.766	68,739	68,808	40,887	28,713						
1896	69,534	92,718	69,696	69,549	62,205	63,153	40,716					
1897	68,250	69,606	92,736	69,555	62,235	76,110	63,357	43,146				
1898	70,938	69,534	69,552	69,597	62,526	63,240	63,240	62,553	63,954	22,707		
1899	69,534	69,615	67,431	90,405	60,246	62,778	62,868	52,344	54,855	44,007	22,884	
1900	69,534	67,494	69,744	69,564	61,719	62,382	62,502	51,471	53,373	62,016	63,066	52,140
Total	757,503	713,637	644,784	597,423	387,519	356,376	292,683	209,514	172,182	128,730	85,950	52,140

ATELIERS ET CHANTIERS DE L'ERMITAGE, À ST. DENIS (SEINE), FRANCE.
WORKS AND YARDS OF L'ERMITAGE AT ST. DENIS (SEINE), FRANCE.
TELEGRAPHIC ADDRESS: BELLEVILLE, SAINT-DENIS-SUR-SEINE.

BALANCE SHEET OF THE STEEL CORPORATION.

The United States Steel Corporation has never given the public a balance sheet, though at the end of the first six months of its corporate existence it gave out a statement of earnings by months for the period. The United States Investor prints a balance sheet, as of June 30, which it claims is official. It is as follows:

ASSETS.

Cost of stocks owned	$1,158,446,560.10
Carnegie bonds owned	157,066,000.00
Organization expenses	753,791.28
Furniture and fixtures	6,979.25
J. P. Morgan & Co., interest account	125,000.00
Sundries	859.54
Cash	26,392,751.47
Federal Steel dividends due	798,471.00
National Tube dividends due	698,390.00
Carnegie & Co. interest account	1,473,815.60
J. P. Morgan & Co. interest and bond account	675,000.00
Total	$1,346,437,618.24

LIABILITIES.

Common stock issued and to be issued	$506,111,596.20
Preferred stock issued and to be issued	508,337,963.90
Bonded debt	301,066,000.00
Vouchers payable	36,688.84
Accrued interest	3,763,325.00
Accrued sinking fund	253,333.32
Profit and loss surplus	26,868,710.98
Total	$1,346,437,618.24
Surplus	26,868,710.97
Dividends	13,957,028.25
Balance	$12,911,687.72

TORPEDO BOATS ARE NOT IN FAVOR.

It will be noted that for the first time in twelve years the naval board of construction has omitted, in its recommendations for naval increase, all provision for the further construction of torpedo boats, torpedo boat destroyers or vessels of the like class. Navy officers say that this is a very significant fact, showing, as it does, the belief on the part of the prominent advisers of the secretary of the navy that craft of this type are no longer regarded as essential to a modern navy. Rear Admiral Melville, a member of the board of construction for many years and chief of the bureau of steam engineering, says that few officers now in the navy believe in the efficiency of the torpedo boat, and points to the experience of the Spanish war when so much was expected of the type, and when it accomplished little or nothing for either side. The navy of this country has now a large fleet of torpedo boats and destroyers which give the officials more concern than all the vessels of the larger classes. The little craft are continually getting out of order and are costing the government more to keep them in commission than they could possibly be worth. There is no question, according to officers of the navy department, that the torpedo boat type is fast becoming obsolete as far as construction along present lines is concerned.

As far back as six years ago, when the other naval powers of the world were increasing their navies with torpedo boats and destroyers, the board of construction unanimously opposed the building by this country of such a large fleet of the vessels; but yielding to the desires of the younger members of the navy, the secretary recommended their construction. Since then there has been a radical change of opinion among officers who originally favored the type, and now the only question to be solved relates to the utility of the submarine torpedo boat. It is understood at the navy department, where the submarine boat at its present stage of development is strenuously opposed, that the Holland Torpedo Boat Co. intends to bring its new boat, the Fulton, to the Potomac river near Washington, so that it may be exhibited this winter to the members of the senate and house committees on naval affairs. A few of the members of these committees are in favor of appropriating money this year for the construction of fifty additional boats of this type, but the navy department will recommend that no action of this nature be taken, pending the completion and test of the new type of submarine boat, which is now building at Bridgeport, Conn., and which is known as the Lake submarine boat.

Wanted—First Class Marine Engine and Boiler Draftsman. A competitive examination will be held at the Naval Academy, January 10, 1902, for a first class marine engine and boiler draftsman at $6.00 per diem. For application and further information apply to Superintendent, Naval Academy, Annapolis, Md. Dec. 5.

"Seaboard Steel Castings."

MANUFACTURERS OF
"THE ADMIRAL" ANCHOR.

THE LATEST AND BEST STOCKLESS ANCHOR.
APPROVED BY LLOYD'S.

ANCHORS CAST AND TESTED ON ORDER, OR STOCK ORDERS PROMPTLY FILLED.

A GUARANTEE OF QUALITY.
OPEN-HEARTH STEEL CASTINGS OF THE HIGHEST GRADE.
FACILITIES FOR CASTINGS UP TO 80,000 POUNDS WEIGHT.
MACHINE WORK AND PATTERNS FURNISHED WHEN REQUIRED.
RAIL OR WATER DELIVERIES.
CAPACITY, 1500 TONS PER MONTH

Seaboard Steel Casting Co.,
CHESTER, PA.

SEND FOR "ELECTROLYSIS OF CONDENSER TUBES"

"BENEDICT-NICKEL"
Seamless Condenser Tubes resist Electrolysis.
BENEDICT & BURNHAM MFG. CO.
WATERBURY, CONN.
New York, 253 Broadway. Boston, 172 High St.

"Steel Ships"
THEIR CONSTRUCTION AND MAINTENANCE."

A valuable work, just from the press, by THOMAS WALTON, Author of "Know Your Own Ship."

Not highly technical, but well suited to Ship Superintendents, Marine Engineers, and Students of ship construction.

Introduction deals with steel from its crude state in ore to finished product in ship material. Then follows chapters dealing with principal structural features and alternative modes in which a vessel may be built. Largest section of the book treats in detail of the construction and combination generally of the various parts which go to make up the whole ship structure—framing, plating, stern frames and rudders, riveting, pumping and ventilation, and includes also remarks upon launching.
Price $5.50.

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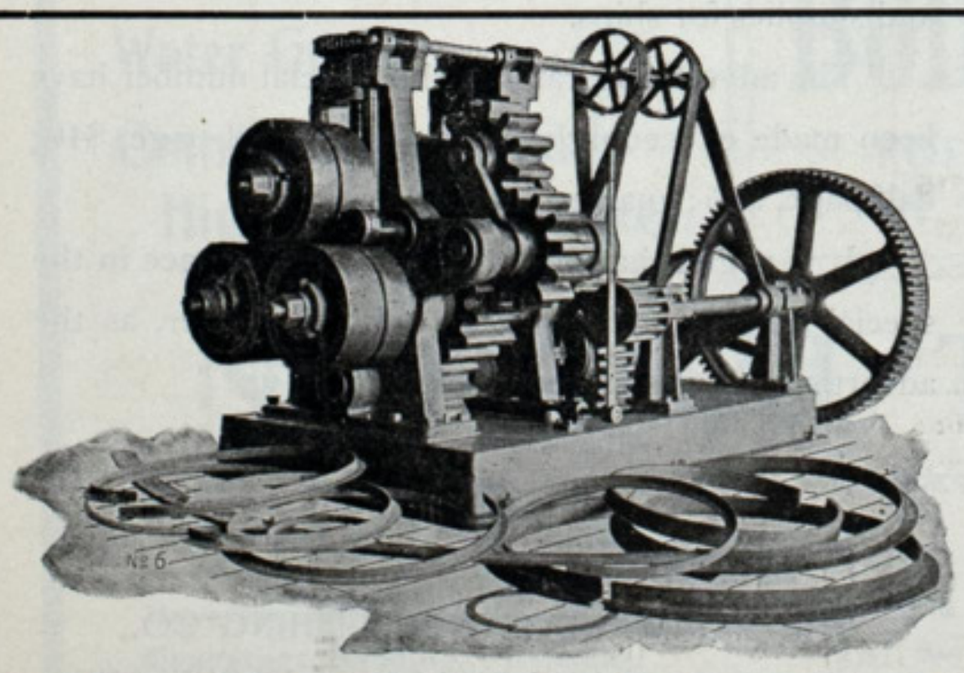

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The Hon. Peter White.

A Biographical Sketch of the Lake Superior Region.

THE Marine Review will begin publishing in its issue of Dec. 12 the biography of the Hon. Peter White of Marquette, Mich.; or to set it more properly out, will begin the history of the development of the iron regions of Lake Superior, for while the sketch is biographical in its nature it is inseparably linked with the development of this marvelous northern country, and the history of one cannot well be told without the other.

There will be much published that has never been told. Many facts will be brought out which make strange reading today, but which are nevertheless incontestible. The actual manuscripts of men, living and dead, having to do with the making of this country, have been examined, and what is interesting has been taken from them.

Fiction does not offer anything as fascinating as this tale of the men who did. The whole story revolves about the Hon. Peter White, because he is the only man whose life encompasses all of it. He was there in the beginning and he is there yet. His advent in the iron region was right upon the heels of the men who actually discovered the iron deposits.

With about 20,000,000 tons of ore tumbling annually upon the docks on Lake Erie, the great gateway to the furnaces, it seems odd that 1,000 tons should ever have been regarded as an avalanche. Yet it is not so very long since 1,000 tons per annum represented the utmost output of a struggling company in the Lake Superior region.

The creation of railways, of docks, of canals—in fact the whole process of winning these deposits which have made the United States the great industrial nation that it is—will be told.

The whole work is an attempt to tell of a phase in the development of the lake region, which, if it is not preserved now, must inevitably perish. It lives now largely in the memory of a few men.

As the edition is necessarily of a limited character those who desire extra copies are advised to order them in advance.

THE MARINE REVIEW PUBLISHING CO.,
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Annual Ship Building Edition.

THE issue of the Marine Review of Jan. 9, 1902, will be the annual ship building number. This issue has grown in stature and in strength since its inception a few years ago. It has not only kept pace with the maritime growth of the nation but it has striven to be a little in advance of it. A trade paper should not only reflect the industry to which it devotes its attention, but should inspire it. It should seek to be a little in advance of the procession.

The Marine Review is quite aware that no subject lends itself so readily to beautiful effects as the product of the ship yards. It is with the aid of these that it purposes to produce a most sumptuous edition. It will be finely illustrated and splendidly printed.

However, the value of the edition will not lie in its setting. It will be a sober review of the ship building industry of the United States—not so much what has been done during the year but what is at the present moment under way. In other words it will be both a directory and encyclopedia of ships upon the stocks and orders to be executed. The value of this to those who cater to the ship building field cannot be over-estimated. It will serve as a living and current reference to the manufacturer of ship yard equipment and supplies for ships.

The advertising rates in this special number have been made exceedingly low, to wit: Full page, $40; half page, $25; quarter page, $15.

It is urged that all those who desire space in the special number forward copy with the order, as the advertising forms are now being made up.

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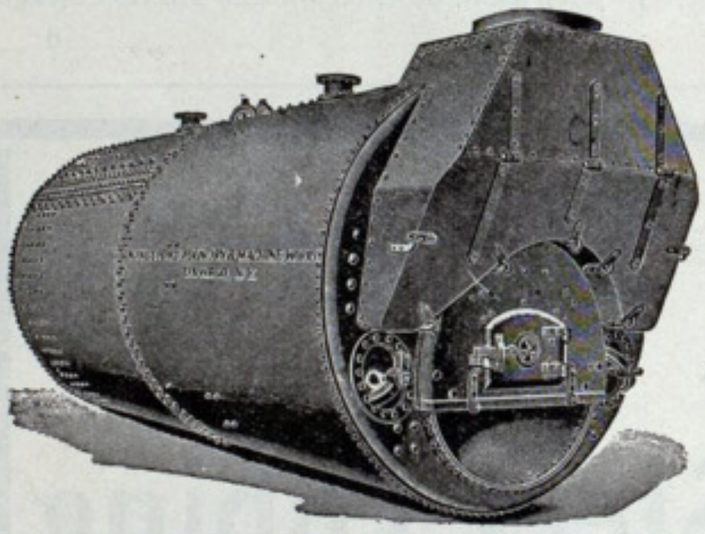

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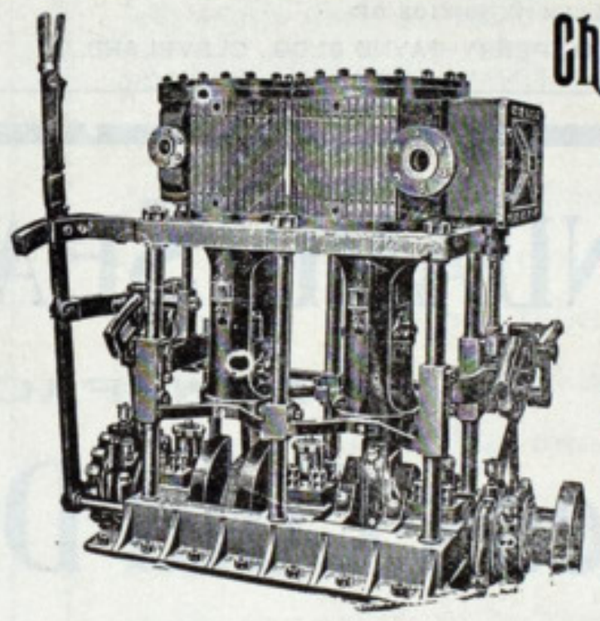

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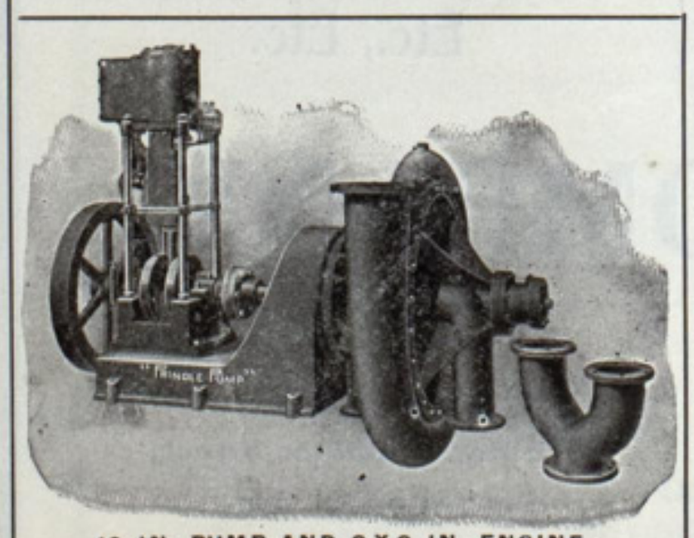

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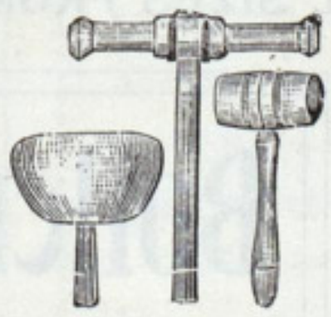

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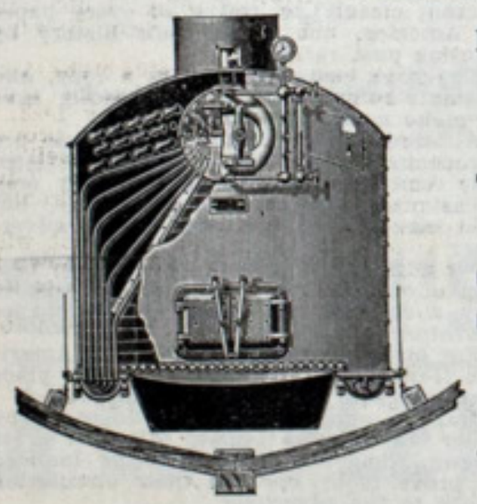

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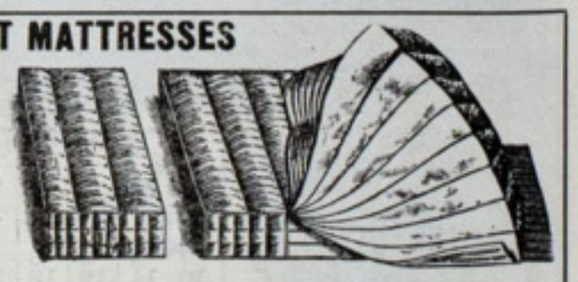

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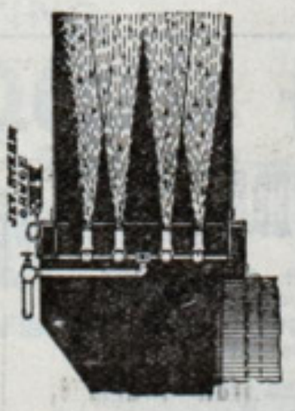

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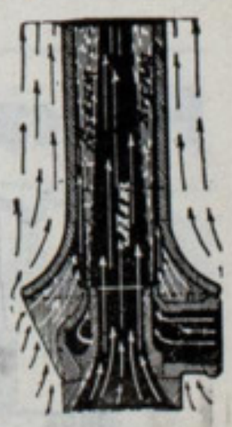

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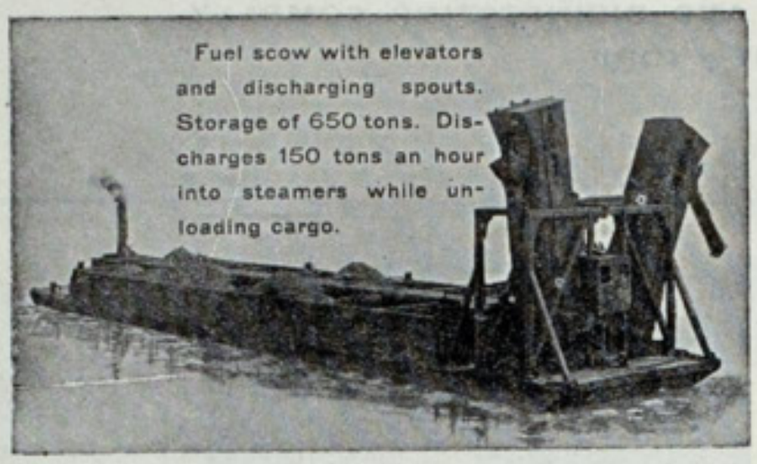

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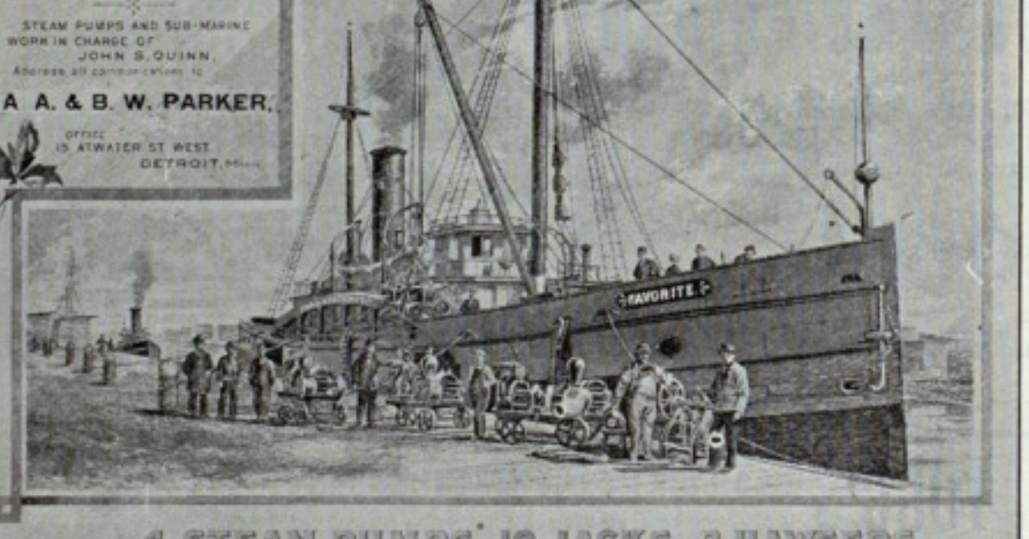

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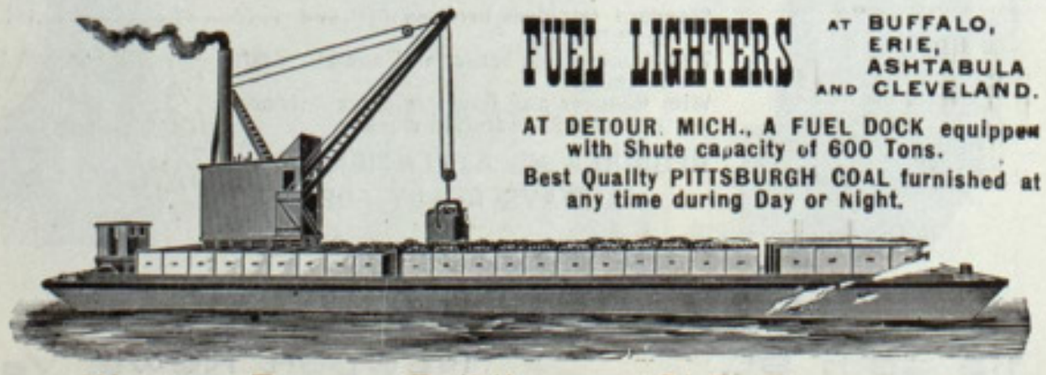

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AIR PUMPS,
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Ports of call...	Buffalo, Detroit, Erie,	Sault Ste. Marie, Mackinac Island,	Hancock, Port Huron,	Marquette, Duluth,	Cleveland, Houghton.
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American Newspaper Directory.

Tells the circulations of all American newspapers. Revised, corrected and reissued every three months. Sixteen hundred pages: Price Five Dollars a volume or $20 a year.

BUFFALO.

We should hardly know how to get along without the American Newspaper Directory. We regard it by all odds the most complete and reliable guide that the advertiser can make use of; in fact, we use no other.

Buffalo, N. Y., July 24, 1901.
R. V. Pierce, M. D.,
President World's Dis. Med. Ass'n.

VERMONT.

The American Newspaper Directory stands, as it has always stood, the first and best of newspaper directories—the only one which cannot be ignored, the only one which every advertiser must have. No other can take its place; no other is needed—Joseph Auld, in the Burlington (Vt.) News of July 3, 1896.

ADVISOR.

The Advisor accepts the American Newspaper Directory as the standard in newspaper ratings. The obstacles which obstruct its efforts to get true and reliable information are many.

* * * *

The directory question is one which interests every publisher in the country—nay, the entire world. But in the United States directories are becoming altogether too numerous. In this, as with other books of reference, it is necessary to have one which may be relied on as being an authority on the matter of newspaper circulations. There can be no question about the fact that at this time, as for many years past, the American Newspaper Directory is that authority. The Advisor is not paid to make this announcement. It makes the statement in the interests of advertisers and publishers because it is true. One thing the advertiser is almost cock-sure of when he refers to the American Newspaper Directory is that the circulation figures he sees therein are not overstated to any great extent. In most other directories they are. Only the publisher himself is to be blamed for not securing a proper rating in that publication, and every advertiser of consequence knows it. Thus the publisher who refuses to furnish a statement places himself under a reasonable suspicion.—The Advisor for June.

New York, June, 1901.

CHICAGO.

Messrs. Geo. P. Rowell & Co.'s American Newspaper Directory has long since earned the reputation of being the best of its character. It contains the results of patient, expensive and systematic effort to secure all attainable information of interest concerning American newspapers. The work has been honestly done. This will not be questioned by any unprejudiced examiner. The most important question is circulation. In attempting to give this information the editor of the Directory encounters his most difficult work. It is the aim and necessity of the Directory to give the truth. The American Newspaper Directory is to-day the dependence and guide, in a greater or less degree, of every large advertiser in the country.—Chicago (Ill.) Daily News.

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The American Newspaper Directory is the only reliable guide for the advertiser.

No man who advertises can afford to do without it.

What Bradstreet and Dun are to the mercantile world the American Newspaper Directory is to the world of periodical publications.

A new advertiser will get from the American Newspaper Directory a better idea of the greatness of his country, and the tremendous possibilities in newspaper advertising, than from any other source.

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The paper that was the leader in its town five years ago may lag behind today. Even one year may witness astonishing changes. If you are spending money for publicity it is vastly important that you should know where to get the most of it for the price. The American Newspaper Directory gives not only the present circulation rating of every paper in America, but shows their history by quoting past ratings.

The book costs five dollars a copy, and a single reference to it may readily save or make many times its cost.

All newspaper directories but one are erroneously optimistic about circulations. The American Newspaper Directory may occasionally err on the other side, but that makes it all the safer for the advertiser.

My advertising experience began in 1885, and one of the first things I did was to buy a copy of the American Newspaper Directory.

For sixteen years Rowell's "The American Newspaper Directory" has had a place of honor and usefulness on my desk.

Many a publisher is ready to prove by other directories that "Rowell's is wrong," but few indeed can be induced to prove it by opening their circulation books to the advertiser.

Among publishers who are not willing that their real circulations be known it is the best hated book in print. The moral is not far to find.

Charles Austin Bates.
New York, June 24, 1901.

Five Dollars a Volume or $20 per annum. Sent, carriage paid, on receipt of price. Address

GEORGE P. ROWELL & CO., Publishers American Newspaper Directory, 10 Spruce St., New York.

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POCAHONTAS SMOKELESS SEMI-BITUMINOUS COAL

THE BEST STEAM COAL IN THE WORLD.

Officially endorsed by Great Britain and United States. Standard Fuel of United States Navy.
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Dearborn Drug & Chemical Works.....Chicago.
Engel & Fagersten.....Chicago.

BOILER FURNACES, FIRE FRONTS, ETC.

Continental Iron Works.....New York.

BOILER RIVETS.

Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BOLT CUTTERS.

Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

BORING AND TURNING MILLS.

Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

BRASS AND BRONZE CASTINGS.

Cramp, Wm. & Sons.....Philadelphia.
Fore River Ship & Engine Co.....Quincy, Mass.
Illinois Smelting & Refining Works.....Chicago.
Phosphor Bronze Smelting Co.....Philadelphia.

BRIDGES, BUILDERS OF.

Scherzer Rolling Lift Bridge Co.....Chicago.

BUCKETS, ORE AND COAL.

Brown Hoisting & Conveying Machine Co.....Cleveland.
McMyler Mnfg. Co.....Cleveland.

CABIN AND CABINET FINISHING WOODS.

Martin-Barriss Co.....Cleveland.

CAPSTANS.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

CHAINS.

Monongahela Iron & Steel Co.....Pittsburg.
Newhall Chain Forge & Iron Co.....New York.
Standard Chain Co.....Pittsburg.

CHAIN HOISTS.

Boston & Lockport Block Co.....Boston, Mass.

CHUCKING MACHINES.

Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

CHUCKS FOR LATHES, DRILLS AND PLANERS.

Skinner Chuck Co.....New Britain, Conn.

CIRCULATOR, EQUILIBRIUM, with Steam Heating Attachment.

Bloomsburg & Co., H.....Newport News, Va.

CLOCKS (Marine), CHRONOMETERS, BELLS.

Ashton Valve Co.....Boston.
Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

COAL PRODUCERS AND SHIPPERS.

Castner, Curran & Bullitt.....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co.....Buffalo.

COAL AND ORE HANDLING MACHINERY.

Brown Hoisting Machinery Co., Incorporated..Cleveland.
Lidgerwood Mnfg. Co.....New York.

COMPASSES.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburgh, Pa.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

CRANES, CONVEYORS, HOISTS.

Brown Hoisting Machinery Co., Incorporated..Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Niles Tool Works Co.....Hamilton, O.
Westinghouse Electric & Mnfg. Co.....Pittsburg.
Wood & Co., R. D.....Philadelphia.

CRANK PINS.

Cleveland City Forge & Iron Co.....Cleveland.

DIVING APPARATUS.

Hale Rubber Co., Alfred.....So. Boston, Mass.
Schrader's Son, A.....New York.

DRILL PRESSES—DRILLS OF ALL KINDS.

Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.

DRILLS, PNEUMATIC.

Standard Pneumatic Tool Co.....Chicago.

DRYING APPARATUS.

American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Sturtevant, B. F. Co.....Boston.

DRY DOCKS.

American Ship Building Co.....Cleveland.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Harlan & Hollingsworth Co.....Wilmington, Del.
Lockwood Mnfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Shipowners Dry Dock Co.....Chicago.
Standard Ship Building Co.....Perth Amboy, N. J.

ELECTRIC LIGHT AND POWER PLANTS.

Badt-Goltz Engineering Co.....Chicago.
Buffalo Forge Co.....Buffalo.
Electro-Dynamic Co.....Philadelphia.
Elwell-Parker Electric Co.....Cleveland.
Fort Wayne Electric Works.....Fort Wayne, Ind.
General Electric Co.....Schenectady, N. Y.
Seidler-Miner Electric Co.....Detroit.
Sturtevant, B. F. Co.....Boston.
Westinghouse Electric & Mnfg. Co.....Pittsburg, Pa.

ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co.....Cleveland.
Fort Wayne Electric Works.....Fort Wayne, Ind.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Westinghouse Electric & Mnfg. Co.....Pittsburg, Pa.

ELECTRIC STEERING GEAR, SPEED AND RUDDER INDICATORS, ETC.

Electro-Dynamic Co.....Philadelphia.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Ship & Engine Co.....Quincy, Mass.
Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated.....New York.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lake Shore Engine Works.....Marquette, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Olds Motor Works.....Detroit.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mnfg. Co.....Milwaukee.
Standard Ship Building Co.....Perth Amboy, N. J.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Willard, Chas. P. & Co.....Chicago.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.
Electro-Dynamic Co.....Philadelphia.
Seidler-Miner Electric Co.....Detroit.

ENGINEERING SPECIALTIES AND SUPPLIES.

Crane Co.....Chicago.
Reilly Repair & Supply Co., James.....New York.

ENGINEERS, MARINE AND MECHANICAL.

Electro-Dynamic Co.....Philadelphia.
Gaskin, Edward.....Buffalo.
Holmer & Goodenough.....New York.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburg.
Powell, Ambrose V.....Chicago.
Roelker, H. B.....New York.
See, Horace.....New York.
Wood, W. J.....Chicago.

EVAPORATING AND DISTILLING APPARATUS.

Reilly Repair & Supply Co., James.....New York.

FANS FOR VENTILATION, EXHAUST, ETC.

American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Reilly Repair & Supply Co., James.....New York.
Smith, W. Blackburn.....Perth Amboy, N. J.

FIRE EXTINGUISHING APPARATUS.

Clayton Fire Extinguishing & Disinfecting Co.New York.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.
Porter's Sons' Co., Wm.....New York.

FOG SIGNALS.

Colt Co., J. B.....New York.
Hamilton-Foster Fog Signal Co.....New York.

FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.

Cleveland City Forge & Iron Co.....Cleveland.
Fore River Ship & Engine Co.....Quincy, Mass.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FURNACES FOR BOILERS.
Continental Iron Works.....New York.

FUELING COMPANIES AND COAL DEALERS.
Castner, Curran & Bullitt (Pocahontas).....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co.....Buffalo.
Smith, Stanley B. & Co.....Detroit.
Youghiogheny & Lehigh Coal Co.....Chicago.

GAS BUOYS.
Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.
Chase Machine Co.....Cleveland.
Lake Shore Engine Works.....Marquette, Mich.
Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

GRAPHITE.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

GRAPHITE BUSHINGS AND BEARINGS.
Graphite Lubricating Co.....Bound Brook, N. J.

HAMMERS, PNEUMATIC.
Standard Pneumatic Tool Co.....Chicago.

HAMMERS, STEAM.
Bement, Miles & Co.....Philadelphia.
Chase Machine Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

HATCH GEARS.
"Long Arm" System Co.....Cleveland.

HAWSERS, WIRE.
American Steel & Wire Co.....Chicago.

HEATING APPARATUS.
Sturtevant, B. F. Co.....Boston.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting Machinery Co., Incorporated..Cleveland.
Chase Machine Co.....Cleveland.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
Marine Iron Co.....Bay City.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

HOSE FOR PNEUMATIC TOOLS.
Sayen & Schultz.....Philadelphia.

HYDRAULIC MACHINERY.
Bement, Miles & Co.....Philadelphia.
Watson-Stillman Co., The.....New York.
Wood & Co., R. D.....Philadelphia.

ICE MACHINERY.
Roelker, H. B.....New York.

INDICATORS FOR STEAM ENGINES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

INJECTORS.
Crane Co.....Chicago.
Jenkins Bros.....New York.

INSURANCE, MARINE.
Brown & Co.....Buffalo.
Chamberlain & Co., S. R.....Chicago.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Helm, D. T. & Co.....Duluth, Minn.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Osborn, F. H. & Co.....Chicago.
Parker, A. A. & W. B.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.
Tandy, Frank N.....Boston.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

LATHES OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.
Pratt & Whitney Co.....Hartford, Conn.

LAUNCHES—NAPHTHA, ELECTRIC.
Gas Engine & Power Co.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.
Porter's Sons' Co., Wm.....New York.

LOGS.
Walker & Son, Thomas.....Birmingham, Eng.
Also Ship Chandlers.

MACHINE TOOLS (WOOD WORKING).
Atlantic Works, Inc.....Philadelphia.

MACHINE TOOLS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.

MALLETS FOR CAULKERS, BOILER MAKERS, ETC.
N. Y. Mallet & Handle Works.....New York.

MARINE RAILWAYS, BUILDERS OF
Crandall & Son, H. I.....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.
Lein, Irvine & Co.....New York.

MECHANICAL DRAFT FOR BOILERS.
American Blower Co.....Detroit.
American Ship Building Co.....Cleveland.
Boston Blower Co.....Hyde Park, Mass.
Bloomsburg & Co., H.....Newport News, Va.
Buffalo Forge Co.....Buffalo.
Detroit Shipbuilding Co.....Detroit.
Sturtevant, B. F. Co.....Boston.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Cramp, Wm. & Sons.....Philadelphia.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.

MILLING MACHINES OF ALL KINDS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

NAUTICAL SCHOOL.
Chicago Nautical School.....Chicago.

NAVAL ARCHITECTS.
Gaskin, Edward.....Buffalo.
Holmer & Goodenough.....New York
See, Horace.....New York.
Wood, W. J.....Chicago.

OAKUM.
Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon Crucible Co., Joseph.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Crane Co.....Chicago.
Garlock Packing Co.....Palmyra, N. Y.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Sayen & Schultz.....Philadelphia.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Toch Bros.....New York.
Upson-Walton Co.....Cleveland.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.
Atlantic Works, Inc.....Philadelphia.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.
Crane Co.....Chicago.

PLANERS OF ALL KINDS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.
Atlantic Works, Inc.....Philadelphia.

PLATE BENDING AND PLANING MACHINES.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

PLUMBING, MARINE.
Reilly Repair & Supply Co., James.....New York.
Sands, Alfred B. & Son.....New York.

PNEUMATIC TOOLS.
Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston.

POWER DOORS AND HATCHES.
"Long Arm" System Co.....Cleveland.

PRESSURE REGULATORS.
D'Este Co., Julian.....Boston.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Ship & Engine Co.....Quincy, Mass.
Hardy, John B.....Tacoma, Wash.
Hyde Windlass Co.....Bath, Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roelker, H. B.....New York.
Sheriffs Mnfg. Co.....Milwaukee.
Standard Ship Building Co.....Perth Amboy, N. J.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.

PROJECTORS, ELECTRIC.
Badt-Goltz Engineering Co.....Chicago.
Elwell-Parker Electric Co.....Cleveland.
Fort Wayne Electric Works.....Fort Wayne, Ind.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Kingsford Foundry & Machine Works.....Oswego, N. Y.
Wood, R. D. & Co.....Philadelphia.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood, R. D. & Co.....Philadelphia.

REFRIGERATING APPARATUS.
American Linde Refrigeration Co.....New York.
Roelker, H. B.....New York.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Automatic Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

R. I. W. DAMP RESISTING PAINT.
Toch Bros.....New York.

RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

RUBBER GOODS.
Hale Rubber Co., Alfred.....So. Boston, Mass.

RUBBER INSULATED WIRES.
Roebling's Sons, John A.....New York and Cleveland.
American Steel & Wire Co.....Chicago.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SEARCH LIGHTS.
Badt-Goltz Engineering Co.....Chicago.
Elwell-Parker Electric Co.....Cleveland.
Fort Wayne Electric Works.....Fort Wayne, Ind.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

SHAPERS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.
Pratt & Whitney Co.....Hartford, Conn.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Ship & Engine Co.....Quincy, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Standard Ship Building Co.....Perth Amboy, N. J.
Trigg, Wm. R. Co.....Richmond, Va.
Willard, Chas. P. & Co.....Chicago.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Moran Bros. Co.....Seattle, Wash.
Reilly Repair & Supply Co., James.....New York.
Upson-Walton Co.....Cleveland.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

SOUNDING APPARATUS.
Farr, C. W.....Chicago.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEAMSHIP LINES, PASS. AND FREIGHT.
American Line.....New York.
Cleveland & Buffalo Transit Co.....Cleveland.
Clyde Line.....New York.
Dominion Line.....Boston.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL CASTINGS.
Seaboard Steel Casting Co.....Chester, Pa.

STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co.....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mnfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.
Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.
Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

SUBMARINE DIVING APPARATUS.
Hale Rubber Co., Alfred.....So. Boston, Mass.
Schrader's Son, A.....New York.

SURVEYORS, MARINE.
Holmer & Goodenough.....New York
Gaskin, Edward.....Buffalo.
See, Horace.....New York.
Wood, W. J.....Chicago.

TELEGRAPH—DECK AND ENGINE ROOM.
Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.
Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburg.

THERMOMETERS FOR MECHANICAL PURPOSES.
Helios-Upton Co.....Peabody, Mass.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.
Standard Pneumatic Tool Co.....Chicago.
Watson-Stillman Co.....New York.
Wood, R. D. & Co.....Philadelphia.

TOOLS, WOOD WORKING.
Atlantic Works, Inc.....Philadelphia.

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

TRAPS, STEAM.
D'Este Co., Julian.....Boston.
Haines Co., Wm. S.....Philadelphia.

TRUCKS.
Boston & Lockport Block Co.....Boston.

TUBING, SEAMLESS.
Benedict & Burnham Mnfg. Co.....Waterbury, Conn.
Standard Seamless Tube Co.....Pittsburg.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crane Co.....Chicago.
Crosby Steam Gage & Valve Co.....Boston.
D'Este Co., Julian.....Boston.
Jenkins Bros.....New York.
Wood & Co., R. D.....Philadelphia.

VARNISH PAINT.
Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.
Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Chamberlain & Co., S. R.....Chicago.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Hall & Root.....Buffalo.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Kennedy Hunter & Co.....Antwerp.
Mitchell & Co.....Cleveland.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.
Tandy, Frank N.....Boston.

VENTILATING APPARATUS FOR SHIPS.
American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.
American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A.....New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.
Atlantic Works, Inc.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.
Wilson & Silsby.....Boston.

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No. 126,	Norwalk Accommodation	†7 55 am	.....
No. 40,	Toledo & Buffalo Accom., via Norwalk	†10 00 am	†11 40 am
No. 106,	Conneaut Accommodation	.....	†4 30 pm
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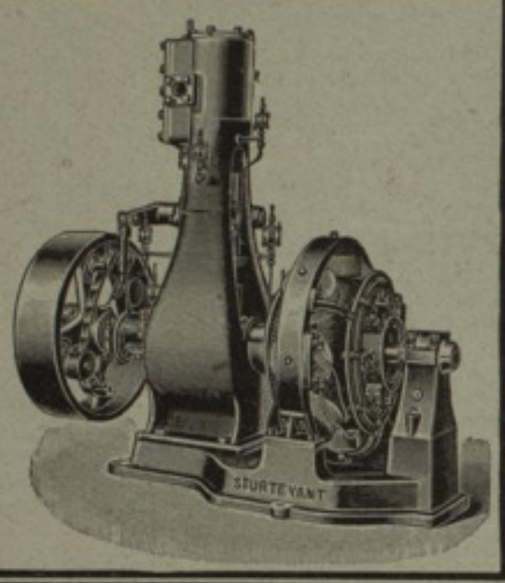

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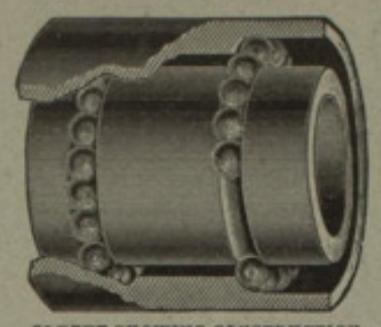

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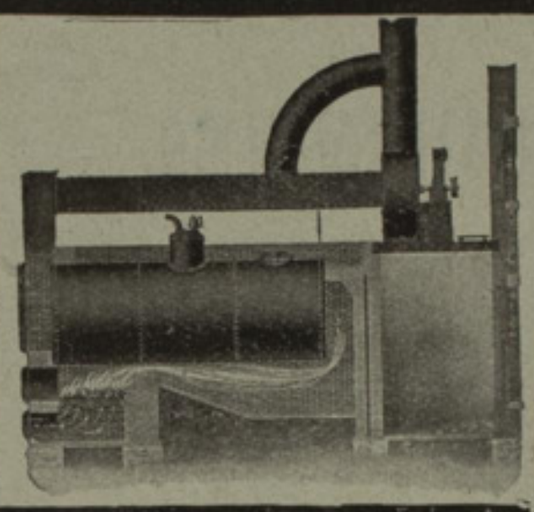

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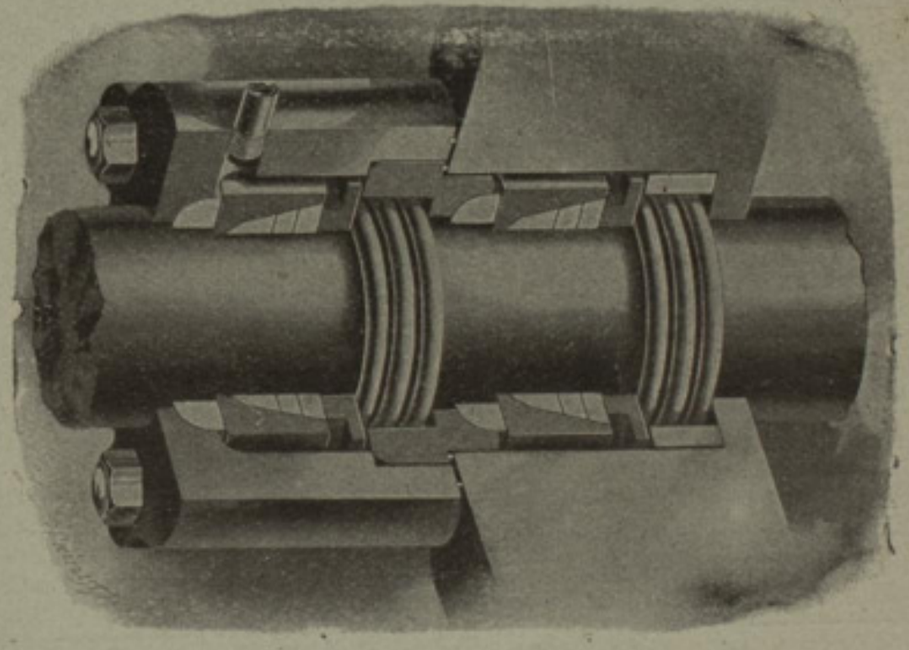

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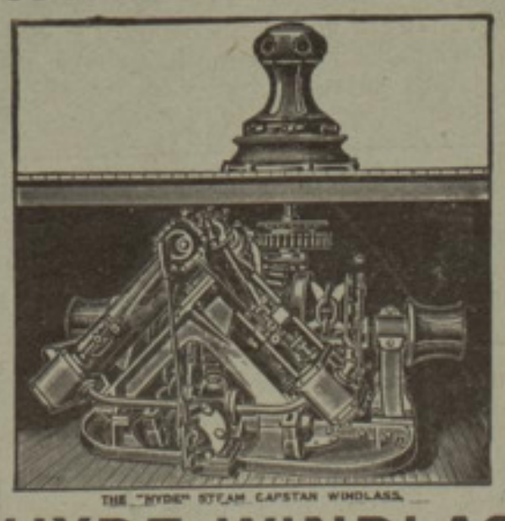

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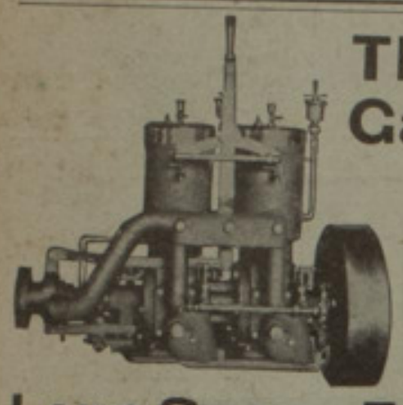

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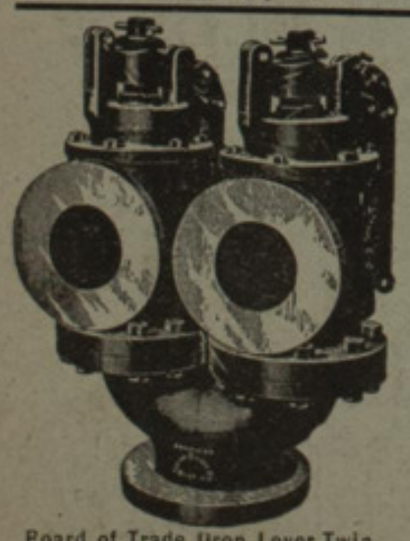

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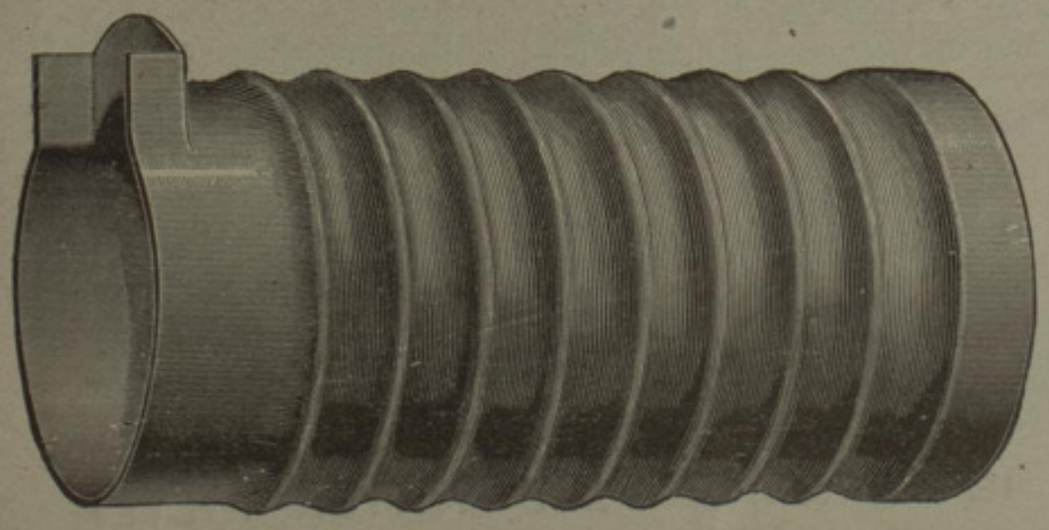

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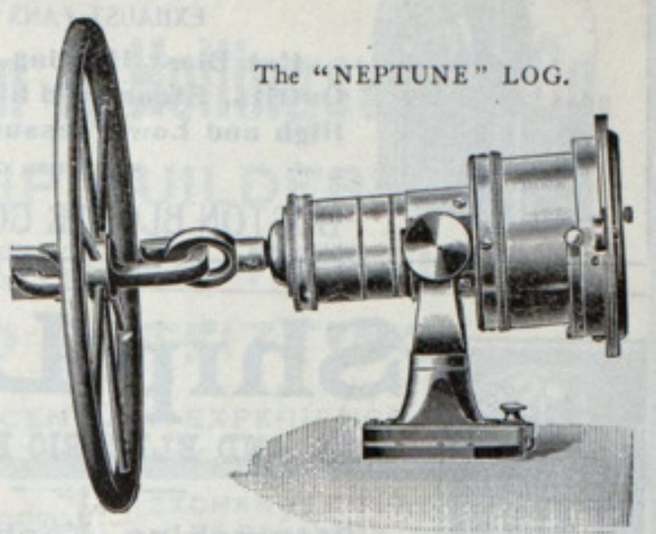
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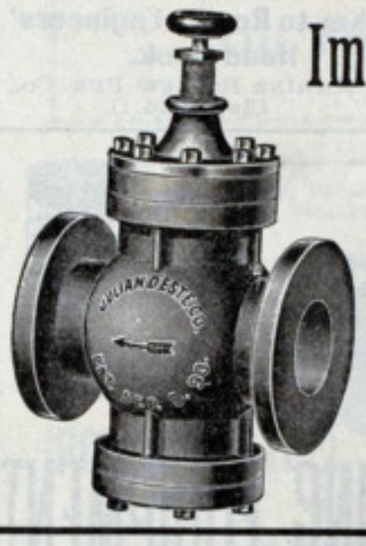

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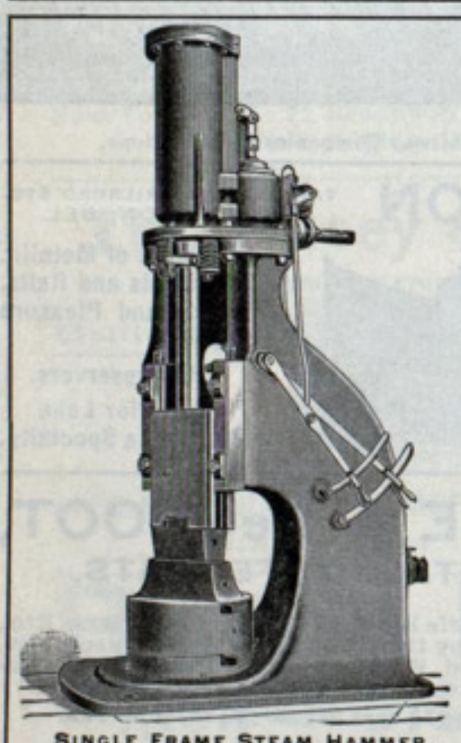
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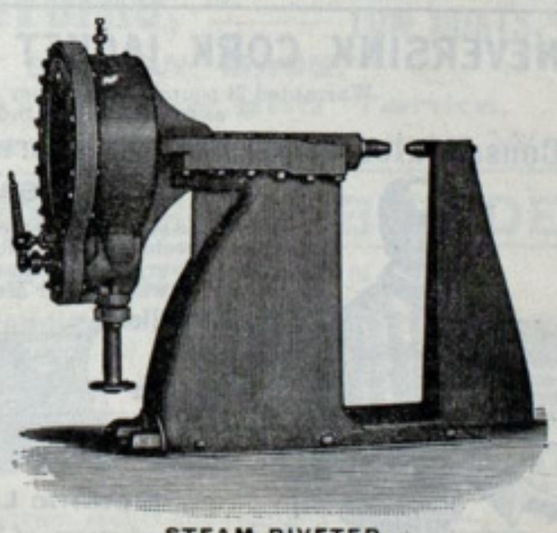
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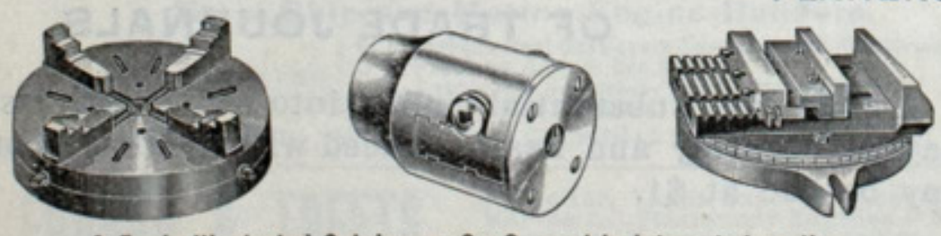

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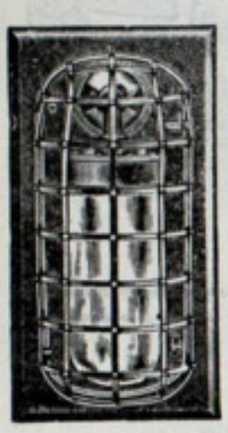

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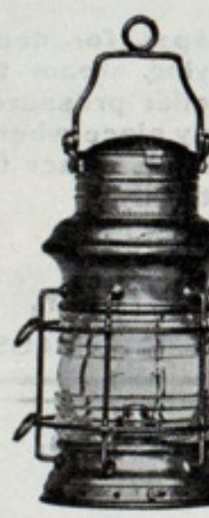

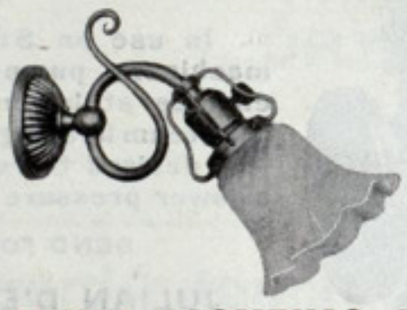

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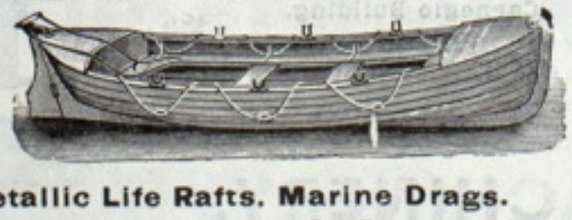

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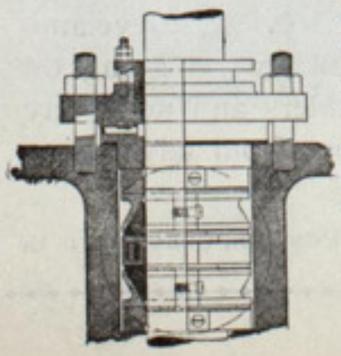

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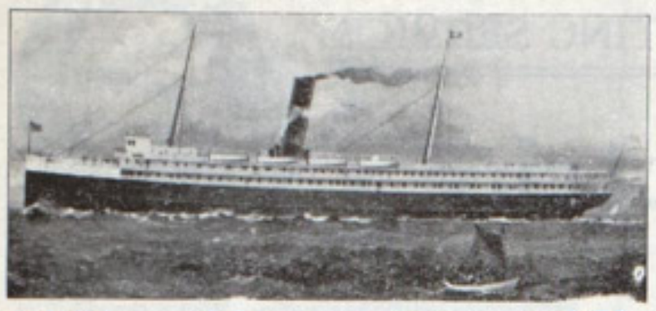

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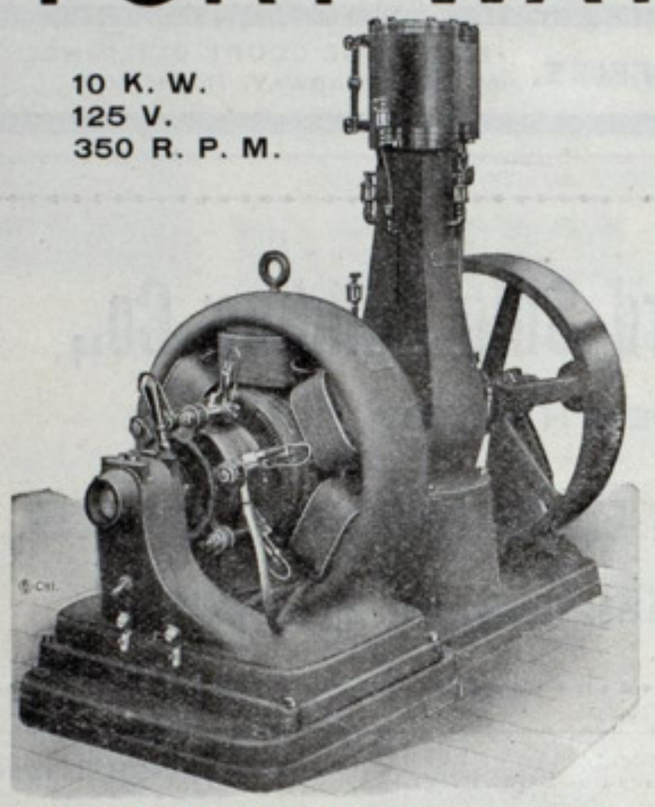

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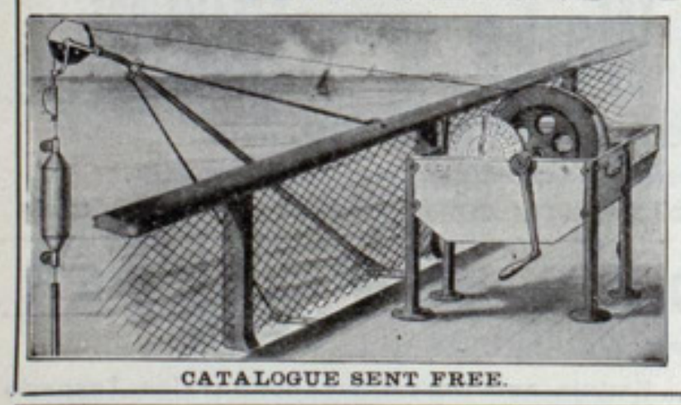

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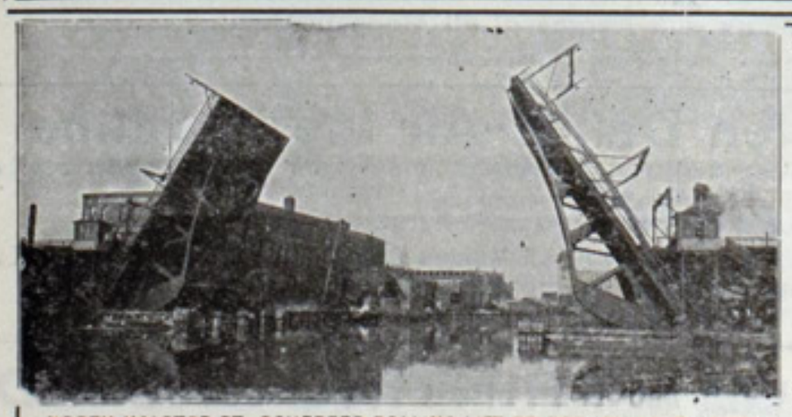

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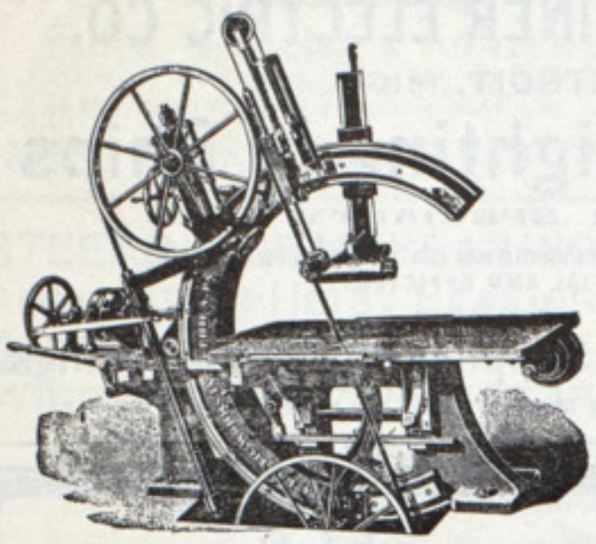

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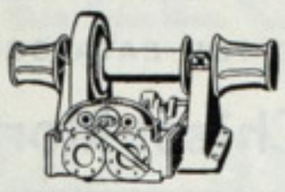

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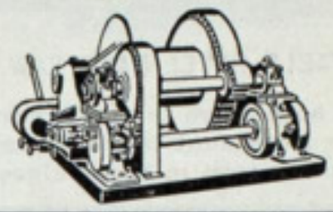

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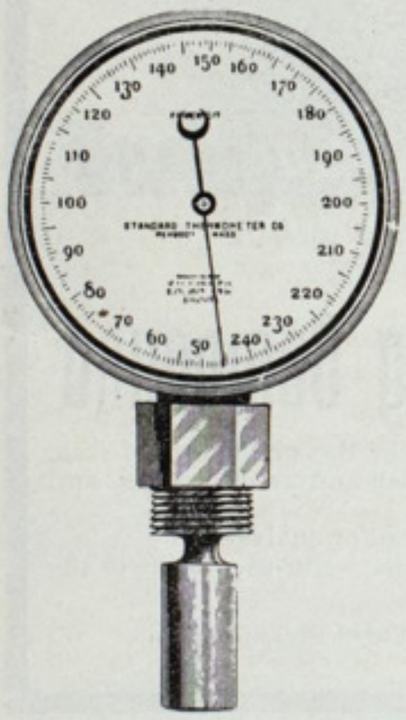

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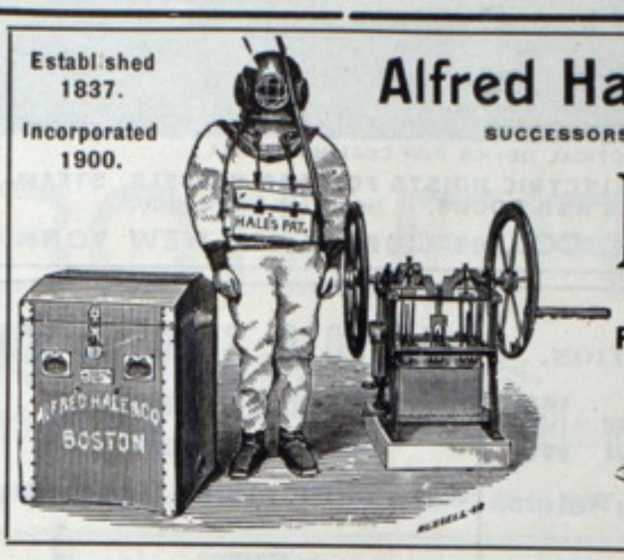

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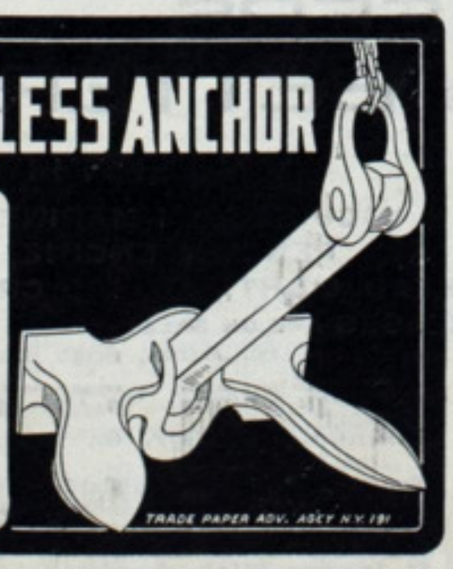

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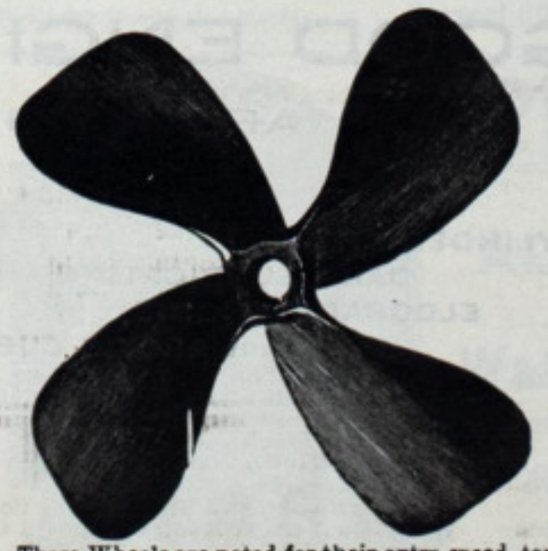

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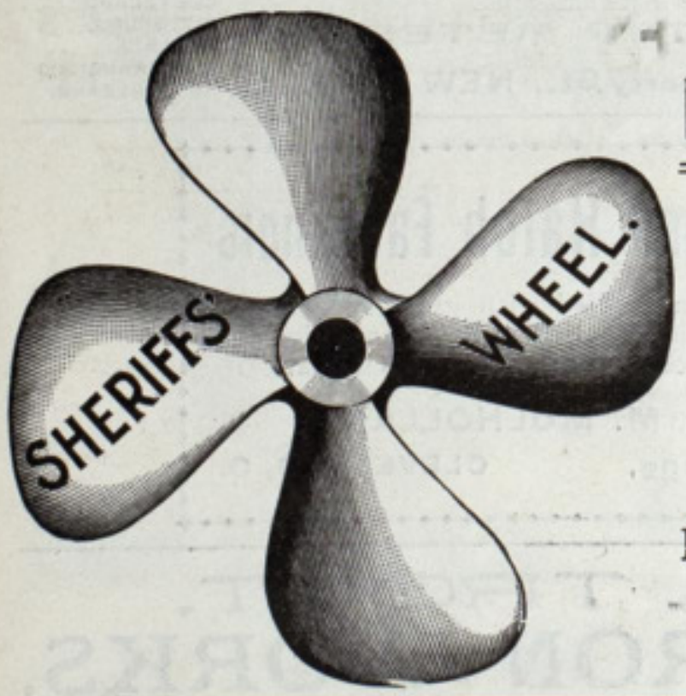

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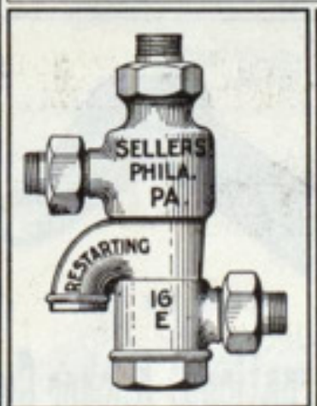

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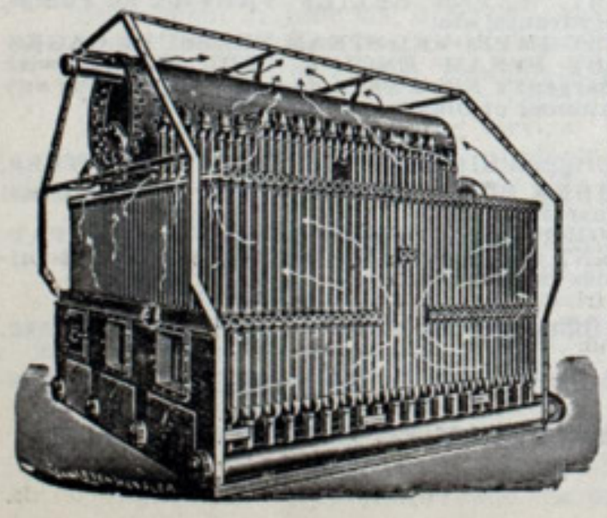

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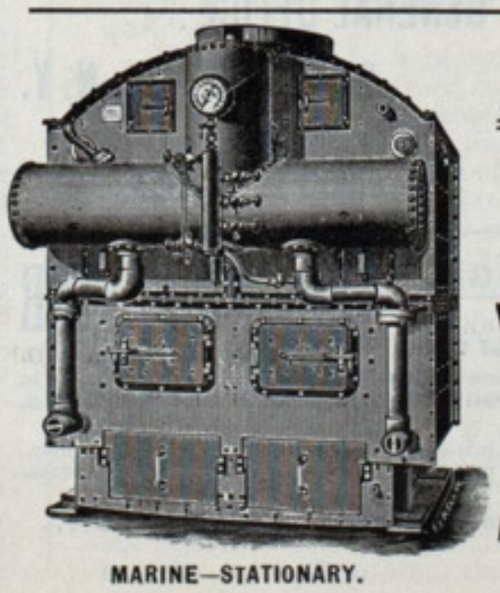

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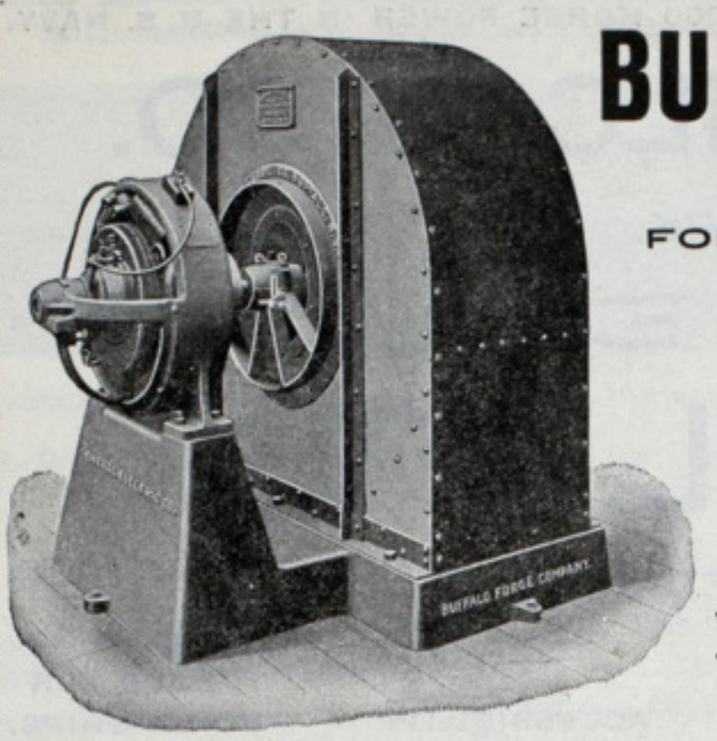

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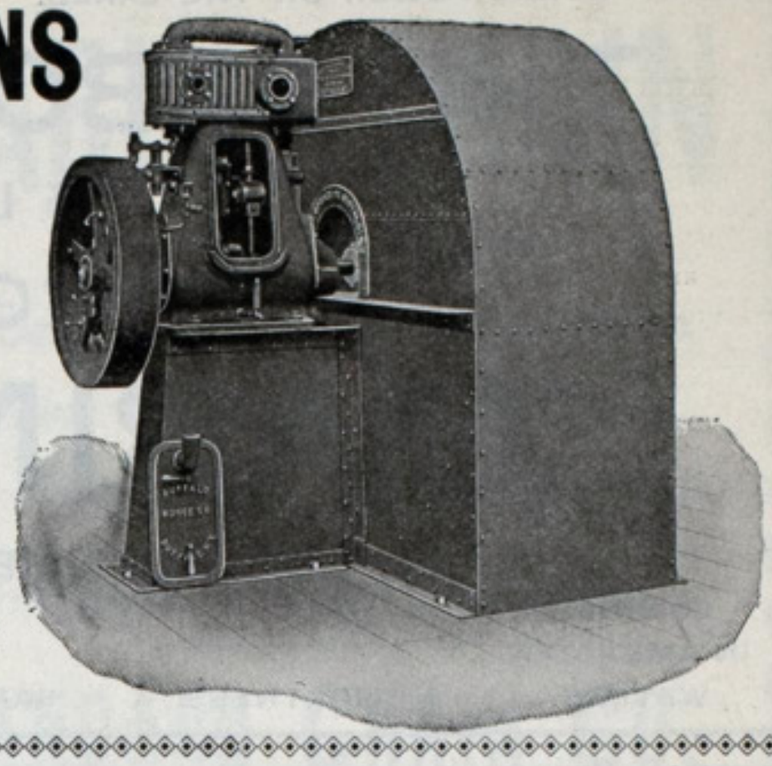

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